Power

Novus FXM 650, 1100, 2000

Total Power Solutions by Alpha Technologies

Uninterruptible Power Supplies

Operator's Manual

Rev 0408

Notice

Rev 0408

Doc# 017-201-B0

Copyright © 2007-2008 Alpha Technologies Ltd. All rights reserved. Alpha® is a registered trademark of Alpha Technologies.

No part of this documentation shall be reproduced, stored in a retrieval system, translated, transcribed, or transmitted in any form or by any means – manual, electric, electronic, electromechanical, chemical, optical, or otherwise – without prior explicit written permission from Alpha Technologies.

This documentation, the software it describes, and the information and know-how they contain constitute the proprietary, confidential and valuable trade secret information of Alpha Technologies, and may not be used for any unauthorized purpose, or disclosed to others without the prior written permission of Alpha Technologies.

The material contained in this document is for information only and is subject to change without notice. While reasonable efforts have been made in the preparation of this document to assure its accuracy, Alpha Technologies assumes no liability resulting from errors or omissions in this document, or from the use of the information contained herein. Alpha Technologies reserves the right to make changes in the product design without reservation and without notification to its users.

About Us

The Alpha Group represents an alliance of independent companies who share a common philosophy – to create world class powering solutions. Collectively, Alpha Group members develop and manufacture AC and DC power conversion, protection and standby products. Applications for these products include broadband, telecom, AC/UPS, commercial, industrial, and distributed generation for a worldwide customer base. In addition, our companies provide a range of installation and maintenance services.

Contact Information

Alpha Technologies Ltd.
4084 McConnell Court
Burnaby BC V5A 3N7 Canada

Tel: 1 604 430 1476
1 800 667 8743
Fax: 1 604 430 1669
Web: www.alpha.com

Contents

Notice ii

1. Product Safety Information 5
General warnings and cautions 5
Certification and compliances 7

2. Introduction 9
What this manual covers 9
Who should read this manual 10
How to use this manual 10
Symbols used in this manual 10
Symbols used on the product 11
Related documents 11

3. Overview 13
Introduction 13
Front panel description 14

4. Site Planning 21
Safety precautions 21
Electromagnetic compatibility (EMC) requirements 22

5. Unpacking the Novus FXM 23
Opening the package 23
Checking the package contents 23

6. Installation 25
Tools and equipment required for installation 25
Mounting the Novus FXM 26
Wiring the external batteries 28
Wiring the Novus FXM 30
ATS/GTS option 31

7. Operation 33
Operating the control panel 34
Turning the Novus FXM on and off 37
Replacing the batteries 39
Operating the Novus FXM 40
Making measurements 42
Viewing the 25-event log 43
Communicating with the RS-232 interface 44
Wiring the RS-232 port 45
Using the main menu 46

Adjusting and controlling the Novus FXM 50
Programming the dry contacts and the clock 51
100-Event Log 54
Novus User Software 56

8. Maintenance 79
Updating the software 79
Testing and replacing the batteries 82
Preventative maintenance 85
Service and technical support 86

9. Troubleshooting 87

Appendix A: Specifications 89

Index 93

Warranty 95

1. Product Safety Information

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS: This manual contains important safety instructions that must be followed during the installation, servicing and maintenance of the product. Keep it in a safe place.

General Warnings and Cautions

WARNING

You must read and understand the following warnings before installing the Novus FXM and its components. Failure to do so could result in personal injury or death.

- Read and follow all instructions included in this manual.
- Do not work alone under hazardous conditions.
- Only qualified personnel are allowed to install, operate and service this system and its components.
- Use proper lifting techniques whenever handling equipment, parts, or batteries.
- Always assume electrical connections or conductors are live. Turn off all circuit breakers and double-check with a voltmeter before performing installation or maintenance.
- Place a warning label on the utility panel to tell emergency personnel a is installed.
- The FXM has more than one live circuit. AC power may be present at the outputs even if the system is disconnected from line or battery power.
- At high ambient temperature conditions, the FXM's surface can be very hot to the touch.
- Battery installation and servicing should be done or supervised by personnel knowledgeable about batteries and their safety procedures.
- If electrolyte splashes on your skin, immediately wash the affected area with water. If electrolyte gets into your eyes, wash them for at least 10 minutes with clean running water or a special neutralizing eye wash solution. Seek medical attention at once.

- Neutralize spilled electrolyte with special neutralizing solutions in a “spill kit” or a solution of 1 lb. (0.45 kg) of baking soda (bicarbonate of soda) in 1 gallon (3.9 L) of water.
- Use special caution when connecting or adjusting battery cabling. An improperly connected battery cable or an unconnected battery cable can result in arcing, a fire, or possible explosion.
- Use new batteries when installing a new unit. Verify that they are all the same battery type with identical date codes.
- Always replace batteries with ones of identical number, type and rating. Never install old or untested batteries. One sealed lead-acid battery is rated to a maximum voltage of 12VDC.
- A battery that shows signs of cracking, leaking or swelling must be replaced immediately by authorized personnel using a battery of identical type and rating.
- Keep the chassis area clear and dust-free during and after installation.
- Keep tools away from walk areas where you or others could fall over them.
- Wear safety glasses when working under any conditions that might be hazardous to your eyes.
- Do not work on the system or connect or disconnect cables during periods of lightning activity.
- Do not smoke or introduce sparks in the vicinity of a battery.
- Never open or damage the batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic and hazardous to the environment.
- A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working on batteries:

- Remove watches, rings, or other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of batteries.
- Disconnect charging source prior to connecting or disconnecting battery terminals.
- Determine if the battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).

- Never let live battery wires touch the FXM, the enclosure or any other metal objects. This can cause a fire or explosion.

- Never dispose of batteries in a fire. The batteries may explode. Follow the manufacturer's directions and check with your local jurisdictions for safe battery disposal.

Caution: You must read and understand the following cautions before installing the Novus FXM and its components. Failure to do so could result in equipment damage.

- Before attaching the batteries to the FXM, make sure the polarity is correct.
- If the batteries have been in storage for more than 3 months, recharge them for at least 24 hours then test them with a load before installation.
- Each AlphaCell™ battery has a date code, found on the warning label, which must be recorded in the maintenance log. If non-Alpha batteries are used, see the manufacturer's documentation for date code type and placement.

Certifications and Compliances

- The Novus FXM has been designed, manufactured, and tested to the requirements of the following national and international safety standards:

☑ CAN/CSA-C22.2 No. 107.3 – Uninterruptible Power Systems

☑ UL 1778 (Edition 4) – Uninterruptible Power Systems

☑ FCC CFR47 Part 15 Class A – This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense..

This page is intentionally left blank.

2. Introduction

What This Manual Covers

This manual provides full procedures for the safe and proper installation, operation, maintenance, and troubleshooting of the Novus FXM. It contains the following chapters and appendices:

- "Product Safety Information" on page 5: Draws your attention to product safety and encourages you to think "Safety First!"
- "Introduction" on this page: Provides information about the manual and explains the meaning of each safety symbol that appears throughout the manual and on the labels of the device.
- "Overview" on page 13: Provides a detailed description of the front panel of the Novus FXM.
- "Site Planning" on page 21: Presents the safety requirements and EMC considerations before you install the Novus FXM.
- "Unpacking the Novus FXM" on page 23: Describes the shipping contents of the Novus FXM.
- "Installation" on page 25: Describes how to mount and wire up the FXM and the tools you need for the job.
- "Operation" on page 33 : Describes how to use the control panel and RS-232 interface to control, program, measure and monitor the Novus FXM.
- "Maintenance" on page 79: Describes how to update the FXM's firmware.
- "Troubleshooting" on page 87: Explains various alarms and faults displays and provides other troubleshooting tips.
- Appendix A: "Specifications" on page 89: Contains detailed specifications (mechanical and electrical) of the Novus FXM.
- "Warranty" on page 95: Provides a detailed description of the terms of the product warranty.

Who Should Read This Manual

This manual is intended for qualified installers – trained electricians or technicians who are fully educated on the hazards of installing electrical equipment such as uninterruptible power supplies and their associated batteries.

How to Use This Manual

Before you begin installing the Novus FXM, please ensure that you are familiar with all the warnings and cautions described in this manual (see “Product Safety Information” on page 5). Once you are aware of all the safety issues, then you can start to plan the installation according to “Installing the Novus FXM” on page 25. After you have completed the installation, you can start learning how to operate and program the system to meet the needs of your application.

Symbols Used in This Manual

This section explains the warning, caution and information symbols used in this manual.

WARNING

Warnings draw special attention to anything that could injure or kill you (the operator) or somebody else, and explain how to avoid these situations. They are placed before the step in the procedure to which they apply. Warnings display the “attention” icon, followed by the word “WARNING” (in bold uppercase) highlighted in gray as shown in this example.

Caution

Cautions draw special attention to anything that could damage equipment or cause the loss of data, and provide information on how to avoid these situations. They are placed before the step in the procedure to which they apply. Cautions display the “attention” icon, followed by the word “Caution” in bold title case as shown in this example.

Note

Notes contain information or options you should remember for future use – something that may seem minor or inconsequential but will be important in the future. Notes display the “push pin” icon, followed by the word “Note” in title case as shown in this example.

Symbols Used on The Product

The following symbol appears on various internal components of the Novus FXM:

Risk of electric shock.

Related Documents

- None

This page is intentionally left blank.

3. Overview

Introduction

The Novus FXM is available in 3 models – FXM 650, FXM 1100 and FXM 2000. The FXM 650 and the FXM 1100/2000 look different, but all of the front panel connectors and circuit breakers operate in the same way. However the circuit breakers for each unit have different ratings. See “Specifications” on page 89 for details. All units operate in the same way unless stated otherwise in this manual.

The FXM 650 is available in the following two version:

- FXM 650-24VDC – with a 24 VDC battery string voltage
- FXM 650-48VDC – with a 48 VDC battery string voltage

The FXM 1100 is available in the following version:

- FXM 1100-48VDC – with a 48 VDC battery string voltage

The FXM 2000 is available in the following version:

- FXM 2000-48VDC – with a 48 VDC battery string voltage.

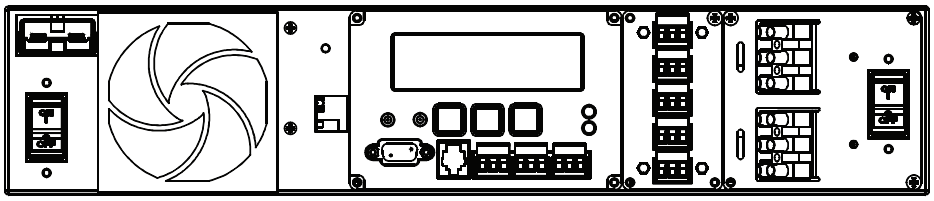


Figure 3.1- FXM 650 Front Panel

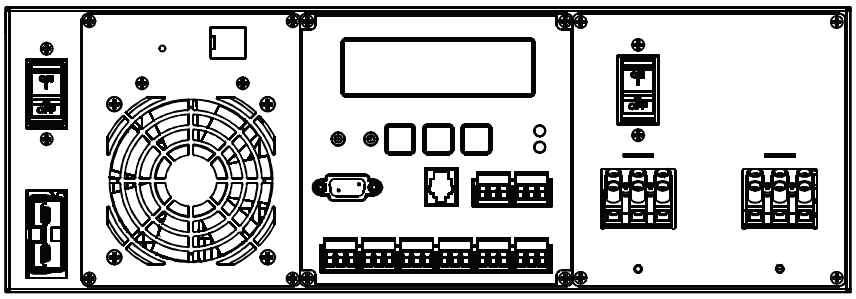


Figure 3.2- FXM 1100/2000 Front Panel

Front Panel Description

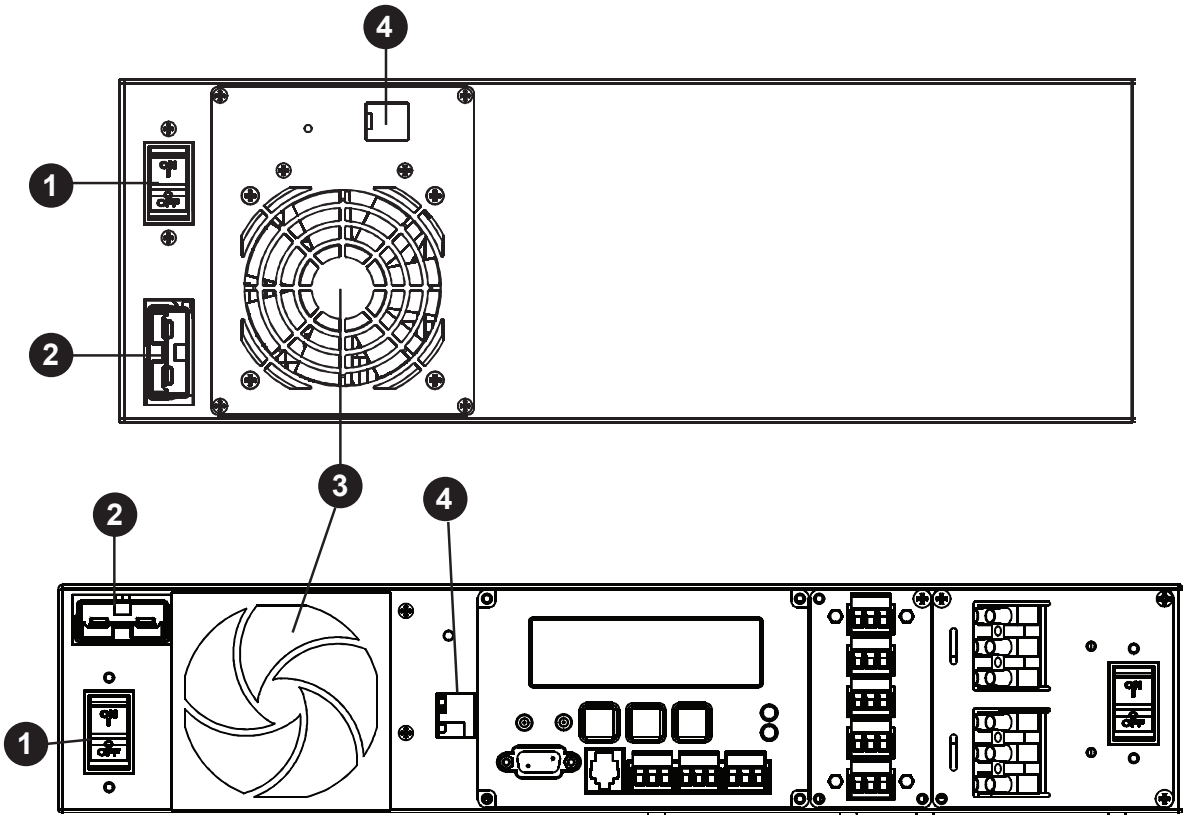


Figure 3.3 - Front Panel Description

1 *Battery Breaker*

This circuit breaker provides overcurrent protection and is an on/off switch for battery power. It must be on for proper FXM operation.

2 *Battery Connector*

This connects the external batteries to the FXM.

3 *Internal Fan*

This microprocessor-controlled fan regulates the FXM's internal temperature for optimum performance. It must not be blocked. If the fan fails, an Alarm is generated (See "Troubleshooting" on page 87).

4 *LAN*

This optional RJ-45 connector is the FXM's Ethernet connector.

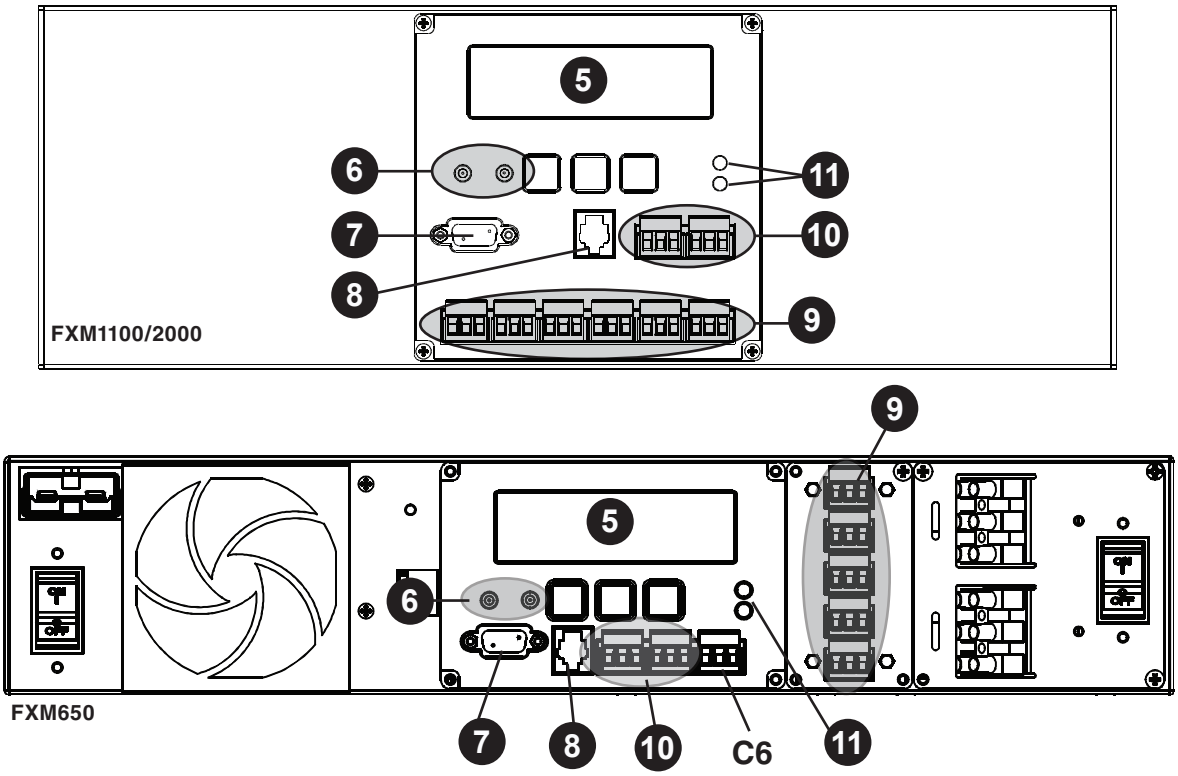


Figure 3.4 - Front Panel Description (cont'd)

5 *LCD Control Panel*

This panel and the cancel, scroll and select buttons below it let you monitor and control the FXM. More information is given in "Operation" on page 33.

6 *Battery Voltage Test Points*

These let you measure the battery voltage. They accept 2 mm diameter test probe tips. The battery circuit breaker must be on to measure the voltage.

Note: The battery voltage test points are not and should not be used as a power outlet.

7 *RS-232*

This DE-9 connector allows you to use a straight-through DE-9 to DE-9 connector cable to connect the FXM to a computer for remote control and monitoring. See "Communicating with the RS-232 Interface" on page 44.

8 *Battery Temp*

This connector attaches the battery temperature sensor

to the FXM for it to monitor the battery temperature. The charging voltage is temperature dependant and the FXM's microprocessor adjusts it for optimum charging.

- The sensor MUST be attached to the FXM for normal operation. Firmly attach the sensor end to the centre battery's case with high-strength flameproof tape (such as duct tape) as shown in "Wiring the External Batteries" on page 28. If it isn't, a "Temperature Probe Unplugged" alarm will appear on the LCD. See "Troubleshooting", Temp Probe Unplugged on page 87.

9 *Contacts C1 to C6*

Contacts C1 to C5 allow you to connect the FXM to an external monitoring panel or to traffic control equipment.

The factory default settings are as given below, but you can program them to meet your requirements (See "Programming the Dry Contacts and the Clock" on page 51). See also "Novus User Software, Operations, Relay and Load Shed" on page 63.

For Contact C6, the default factory configuration for the FXM 650-48, FXM 1100 and FXM 2000 is +48VDC output (FXM 650-24 is +24VDC), but it can be factory configured as a dry contact.

Figure 3.5 shows the contact's layout while Figure 3.6 shows the +48VDC or +24VDC terminal block layout.

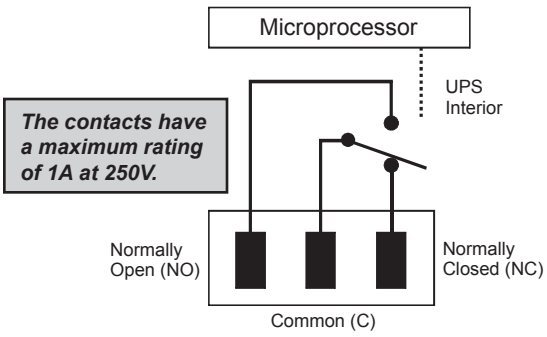


Figure 3.5 - Contact Layout
(Standard for C1 to C5, Factory Option for C6)

- **C1:** This contact is energized when line power is unqualified and the FXM provides backup battery power to the load(s). It can be called the "On Battery" contact.
- **C2, C3:** These contacts are energized when the battery drops below a pre-set voltage level. They can be called the "Low Battery" contacts.
  You can change the pre-programmed level to match the batteries used and the actual operating conditions. *See*

"Operating the Novus FXM "#35 Low Battery Warning Voltage." on page 40.

- **C4:** This contact is energized after the FXM has been in Inverter mode for 2 hours. It can be called the "Timer" contact.
  You can change the pre-programmed 2 hours to match your operating conditions. ***See*** "Programming the Dry Contacts and the Clock, Setting the Timer Contact." on page 52.
- **C5:** This contact is energized when the FXM is operating close to the specified limits. It can be called the "Alarm" contact.
- **C6:** The factory default layout for this contact is a relay that is energized when the FXM is in Line or Inverter modes and is de-energized when it is in Standby mode. It provides 48VDC (500 mA) or 24VDC (500 mA) from the external batteries to an external fan or other equipment. C6 can be factory-configured as a dry contact.

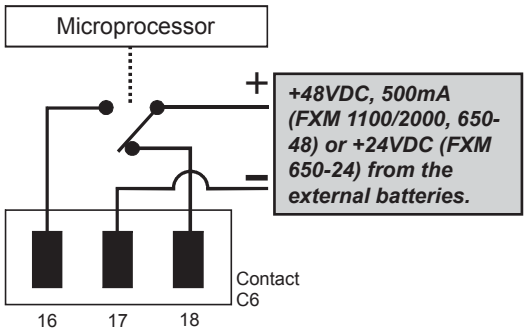


Figure 3.6- 48VDC/24VDC Contact Layout
(De-energized Shown, Factory Default for C6)

10 *Contacts C7 and C8*

These optically isolated inputs let you attach an external switch panel for remote control of the FXM or have the FXM control Alpha Technologies's optional Automatic Transfer Switch (ATS).

- **User Input (C7):** This relay has 3 contacts to control the FXM (Figure 3.7). They are:
  19 (S1): Shorting this contact starts the FXM's self test. Also see "Operating the FXM, Self Test." on page 40.
  20 (S2): Shorting this contact activates an alarm. Also see "Troubleshooting", User Input Alarm on page 87.
  21 (S3): Shorting this contact disables the AC output. There is no AC output power, the LCD display shows "SHUTDOWN" (Model 1000 only), but the FXM is still energized. A manual restart is required to put the FXM back to normal operation.

22 (C): Isolated return for contacts S1, S2 and S3. It is located on contact C8 (#22).

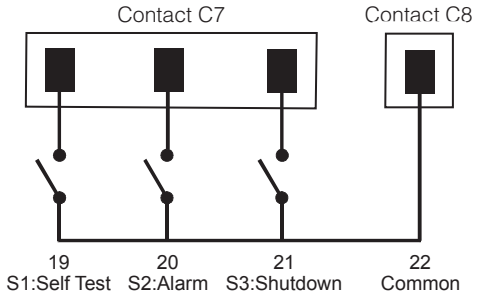


Figure 3.7- User Input Layout

- **ATS (C8):** When the FXM is in Inverter mode, this normally open relay closes (Figure 3.8), sending 48 VDC (FXM 650-48, 1100, 2000) or 24 VDC (FXM 650-24) from the external batteries to this dry contact. If the optional Alpha Technologies's Automatic Transfer Switch (ATS) is connected, it will cause the ATS to switch the load from line power to the FXM's battery backup power.

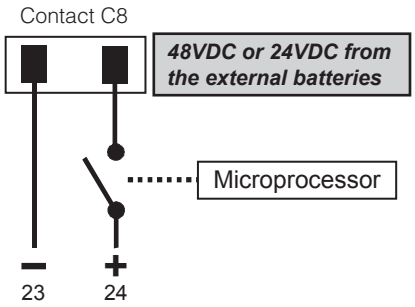


Figure 3.8 ATS Layout

11 *Status and Alarm LEDs*

- **Status:** When this green LED is on, the FXM is in Line mode and line power is provided to the load. When it is flashing, it is in Inverter mode and backup battery power is provided to the load.
- **Alarm:** When this red LED is on, the FXM has a fault. When it is flashing, it has an alarm (***See*** "Troubleshooting" on page 87).

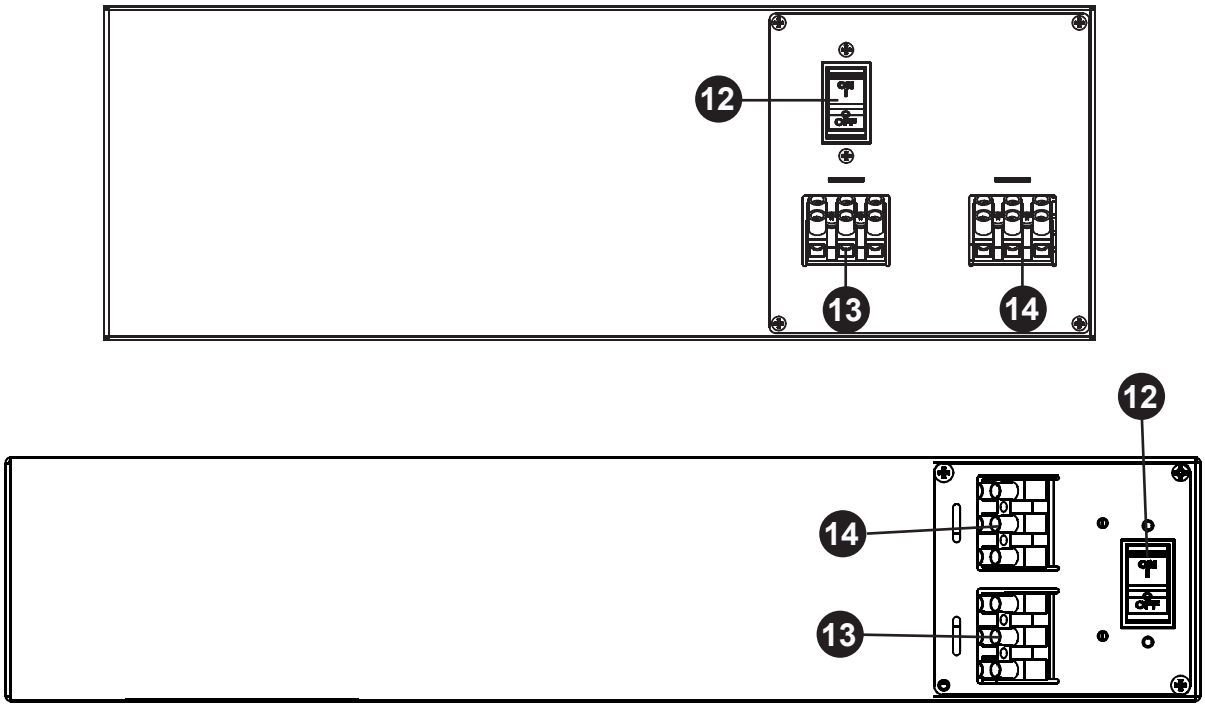


Figure 3.9 - Front Panel Description (cont'd)

12 *Input Circuit Breaker*

This circuit breaker is an on/off switch for line power into the FXM and provides input protection. It must be on for proper FXM operation.

13 *Input Terminal Block*

This terminal block is the FXM's AC line power input.

14 *Output Terminal Block*

This terminal block is the FXM's AC power output.

This page is intentionally left blank.

4. Site Planning

WARNING

Restricted Access: The Novus FXM must be installed in a restricted area accessible only by qualified service personnel.

WARNING

Grounding: The Novus FXM must be correctly grounded for proper operation. Older facilities may have inadequate electrical grounding. Inspection must be performed by a qualified electrician before installation to ensure that grounding meets the local electrical code.

WARNING

Branch Circuit Protection: The utility line attached to the Novus FXM's input MUST be protected by a circuit breaker certified for this use in accordance with the local electrical code.

For the FXM 1100, to reduce the risk of fire, connect a minimum of a 20A circuit breaker (for 120VAC units) or a 10A (for 230VAC units).

WARNING

Disconnect: The input and output lines to and from the Novus FXM MUST have disconnect devices attached.

Safety Precautions

Observe the following safety precautions when setting up the Novus FXM:

- Install the FXM on a surface that can support its weight. See Specifications on page 89.
- The input wiring must reach a suitably grounded power outlet and the load wiring must reach the FXM's output terminal blocks.

- The FXM should be placed at a properly sheltered located or inside a weather-proof enclosure to protect the electronics from water, dust and other possible contaminations.

Note: Alpha Technologies Ltd. offers a wide range of outdoor enclosure systems. Visit our website at www.alpha.com, or call customer service for more information.

- Backup Generator (If used)
  In Generator Mode, the FXM's range of acceptable input frequency and voltage is expanded to accept the fluctuations created by a generator (See "Operating the Novus FXM, Sense Type" on page 40.).
  Use a generator with electronic speed and voltage controls which produces less than 10% voltage Total Harmonic Distortion (THD). Mechanical governors can force the FXM to run continuously in Battery mode. Before installation, make sure the generator's output voltage is compatible with the FXM's input voltage requirements. To make sure the system runs smoothly, use a generator that supplies twice as much power as drawn by the total load.

Electromagnetic Compatibility (EMC) Requirements

Observe the following EMC requirements when setting up the Novus FXM and its internal equipment:

- All AC mains and external supply conductors must be enclosed in a metal conduit or raceway when specified by local, national, and/or other applicable government codes and regulations.
- The customer facilities must provide suitable surge protection.

5. Unpacking the Novus FXM

Opening the Package

Follow these guidelines for unpacking the Novus FXM.

WARNING

Heavy Object: The Novus FXM. is heavy (up to 35 lb (15.9 kg)). Use proper lifting techniques. The lifting and moving should be done by at least two personnel to avoid injury.

1. Select a suitable area for unpacking.
2. Store all packing material and boxes for possible equipment returns.
3. Check the contents in your product package. See “Checking the Package Contents” on this page.
4. Compare the packing slip and the list of parts with the items you received. If the list of parts on your packing slip does not match the items you received, or any items appear damaged, immediately notify your carrier agent and the supplier who prepared your shipment.

Checking the Package Contents

Before you begin installation, inspect the package contents and make sure the following standard items as well as purchased options are included.

Standard items	
Qty	**Item**
1	Novus FXM
1	Novus FXM Operator’s Manual
8	Terminal blocks and labels for the dry contacts
1	Temperature sensor cable

Available optional items	
Qty	**Item**
	Batteries, if ordered from Alpha, will be shipped separately.
	Enclosure (with optional mounting hardware kit)
	Battery heating mats

6. Installation

WARNING

Grounding: The Novus FXM. module MUST be correctly grounded for proper operation.

WARNING

Disconnects: The input and output lines to and from the Novus FXM. MUST have disconnect devices attached.

WARNING

Restricted Access: The Novus FXM. must be installed in a restricted area accessible only by qualified service personnel.

Once the installation location has been planned and prepared, you are ready to install the Novus FXM.

There are 3 steps to setting up the Novus FXM:

1. Mounting the Novus FXM. on page 26.
2. Wiring the external batteries on page 28.
3. Wiring the Novus FXM. on page 30.

Tools and Equipment Required for Installation

- DC voltmeter
- Labels or masking tape and marker
- Torque wrench (for input/output terminal blocks)
- Slot head screwdriver to fit the terminal blocks
- Minimum #10 AWG copper wire for input/output terminal blocks
- High strength, flame-proof tape (such as duct tape)
- Battery terminal corrosion inhibitor (such as NOCO Company's NCP-2 or Sanchem Inc.'s No-Ox ID Grease "A")

Mounting the Novus FXM.

The FXM can be placed on a shelf with no other parts needed. Any version of the FXM can be rack or wall mounted or secured to a shelf, such as on an outdoor enclosure's shelf, with the optional mounting brackets as shown in Figure 3.10. The brackets and the screws to attach them to the FXM's case are available from Alpha Technologies (part number 740-697-21).

Caution: Terminal block covers and the battery harness restraining bracket MUST be used and are available from Alpha Technologies (part number 740-698-21). If the FXM end application is mounted inside an enclosure or in an area restricted to authorized personnel, then the covers and bracket may or may not be needed.

Note: To meet NEBS Level 1 specifications when you are installing this unit in a rack or frame, you MUST:

1. Before installation, clean all attachment points on the FXM, rack and mounting brackets and bring them to a bright finish. Then coat them with an anti-oxidant (such as Sanchem Inc.'s No-Ox ID "A-Special Electrical Grade" or equivalent).
2. Attach the mounting brackets with the thread forming screws and the paint piercing washers provided with the brackets to insure adequate grounding between the FXM's chassis and the rack.

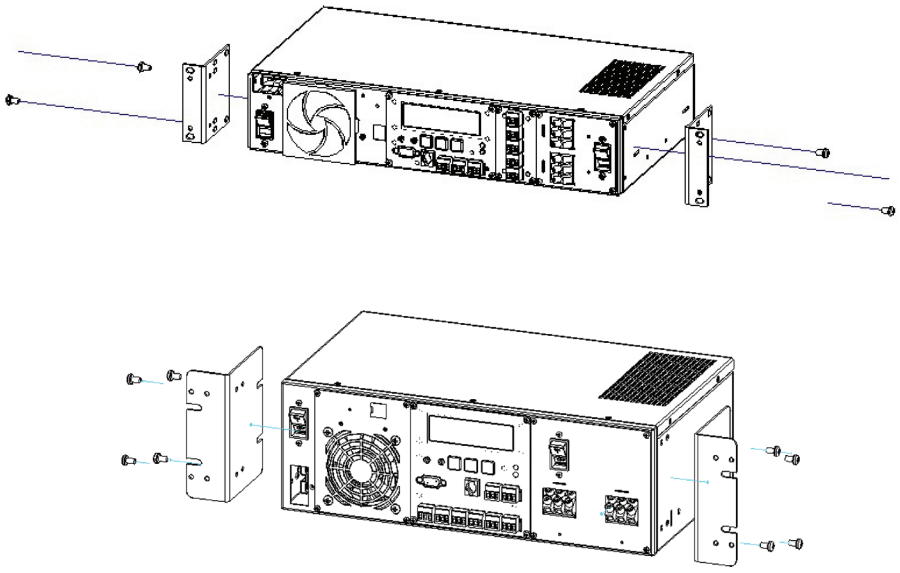
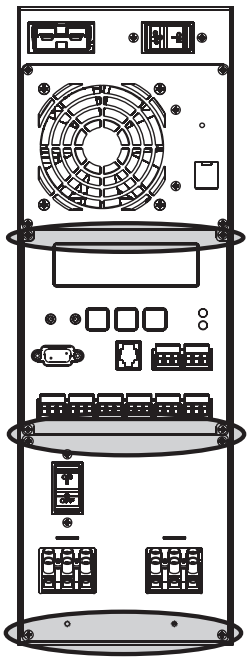


Figure 3.10 - Mounting the FXM
Mounting brackets position for rack mounting (rotate to fit either 19-inch or 23-inch racks).

For the FXM 1100/2000 units only, the control panel and the power connection panel can be rotated to suit your needs. To rotate either

one, unscrew the screws in each corner, remove the panel, rotate it and reinstall the screws.

Caution: Use care to avoid damaging or pulling out the wires or the ribbon cables when rotating the panels.



Wiring the External Batteries

WARNING

The batteries must be installed by qualified personnel trained in the safe use of high-energy power supplies and their batteries.. Refer to Product Safety Information on page 5.

Notes:

1. Use new batteries when installing a new unit. Verify they are all the same battery type with identical date codes.
2. For the FXM 650-24, the battery string is 24VDC. For the FXM 650-48/1100/2000, the battery string is 48VDC.
3. If you are making your own battery wiring harness, use at least 10 AWG (for FXM 650/1100) or 8 AWG (FXM 2000).
4. The battery return connection is to be treated as an Isolated DC return (DC-I) as defined in GR-1089-CORE.

Procedure

1. For FXM 650-48/1100/2000 (48 V battery string), number the batteries from 1 to 4 with labels or tape. For FXM 650-24 (24 V battery string), number the batteries from 1 to 2. See Figure 3.11.

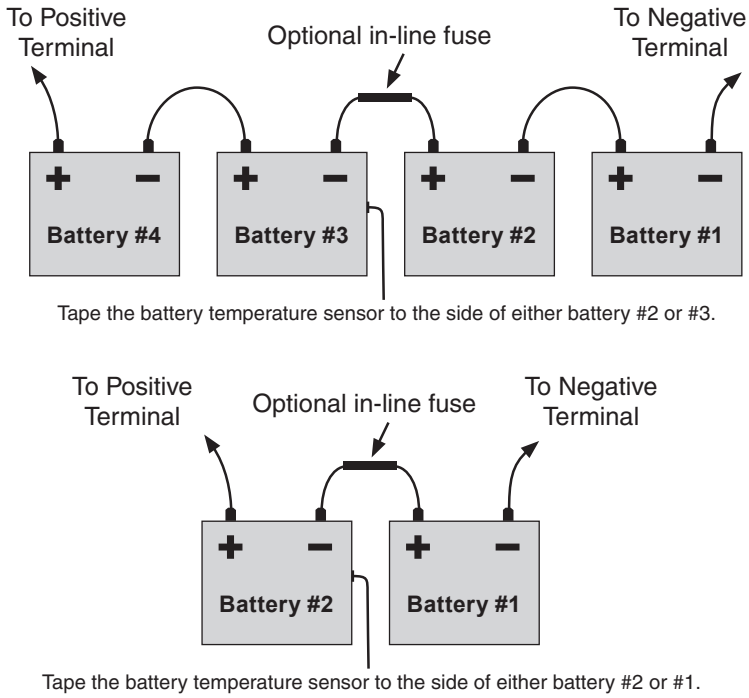


Figure 3.11- External Battery Wiring (for 48VDC string (top) and 24VDC string)

2. Coat the battery terminals with battery corrosion inhibitor.

Caution: Torque the battery terminals according to the manufacturer's specifications as given on the name plate or data sheet.

3. Wire the batteries as shown in Figure 3.11. If used, install the in-line fuse as shown.
4. Verify battery connector polarity and DC voltage with a DC voltmeter. If correct, attach it to the FXM's external battery connector. Otherwise, perform troubleshooting before connecting it to the FXM.
5. Route the sensor end of the battery temperature cable to the batteries. Tape it to the side of battery as shown in Figure 3.11.
6. If multiple battery strings are used, repeat steps 1 to 4 as required.

Wiring the Novus FXM

WARNING

Make sure the line power is off. Turn off all input and output circuit breakers on the FXM before making any electrical connections.

WARNING

If stranded wires are used to connect the input and output terminal blocks, ferules or equivalent crimping terminals must be used.

Procedure

1. Connect the temperature sensor to the FXM (Batt Temp connector 8 in Figure 3.4 on page 15). Attach the end of the battery temperature sensor to the side of the centre battery (See Figure 3.11).
2. If used, connect the following ports:
   - Ethernet port 4 in Figure 3.3,
   - RS-232 port 7 in Figure 3.4
   - Dry Contacts 9 in Figure 3.4
   - User Inputs 10 in Figure 3.4
3. Connect the load to the FXM's Output terminal block 14 in Figure 3.9. Torque to 12.0 lb-in (1.4 N-m).
4. Connect the line power to the FXM's AC Input terminal block 13 in Figure 3.9. Torque to 12.0 lb-in (1.4 N-m).

WARNING

Before proceeding, verify that the line wire is attached to the line terminal block, the ground wire is attached to the ground terminal block and the neutral wire is attached to the neutral terminal block to prevent accidental shocks or electrocutions.

5. Connect the external batteries to the Battery connector 2 in Figure 3.3. Refer to "Wiring the external batteries" on page 28.
6. If needed, attached the terminal block covers and battery harness restraining bracket (See "Mounting the Novus FXM" on page 26).

ATS/GTS Option

The ATS (automatic transfer switch) and the GTS (generator transfer switch) are two separate optional add-on switching units for the FXM family (FXM 650, 1100 and 2000). The ATS provides power and/or bypass capacity (automatic or manual) so the operator may disconnect the FXM family of products from line power for easy removal and servicing. In bypass mode, the loads are directly connected to the line power without any conditioning. The ATS and GTS can be used alone or together to allow the use of 3 different back-up sources (line, batteries and or generator). Refer to the ATS/GTS Installation Manual (Alpha P/N 020-161-B0) for details.

WARNING

Make sure you have read and understood the instructions given in the ATS/GTS Installation Manual before making any connection to the supply.

Installation and wiring instructions are provided on a separate installation manual (020-161-B0).

This page is intentionally left blank.

7. Operation

The following sections describe the operation of the Novus FXM.

- Operating the control panel on page 34.
- Turning the FXM On and Off on page 37.
- Replacing the batteries on page 83.
- Operating the Novus FXM on page 40.
- Making measurements on page 42.
- Viewing the 25-event log on page 43.
- Communicating with the RS-232 interface on page 44.

Operating the Control Panel

The LCD control panel provides “at a glance” monitoring. This panel, when used along with the **CANCEL**, **SCROLL** and **SELECT** buttons below it, lets you program, make measurements and troubleshoot the FXM. The layout is shown in Figure 7.1 below.

The FXM is monitored and controlled with a series of menus and submenus. The Menu Tree is shown in Figure 7.3. For a tutorial on how to use this panel, see “Replacing the Batteries” on page 83.

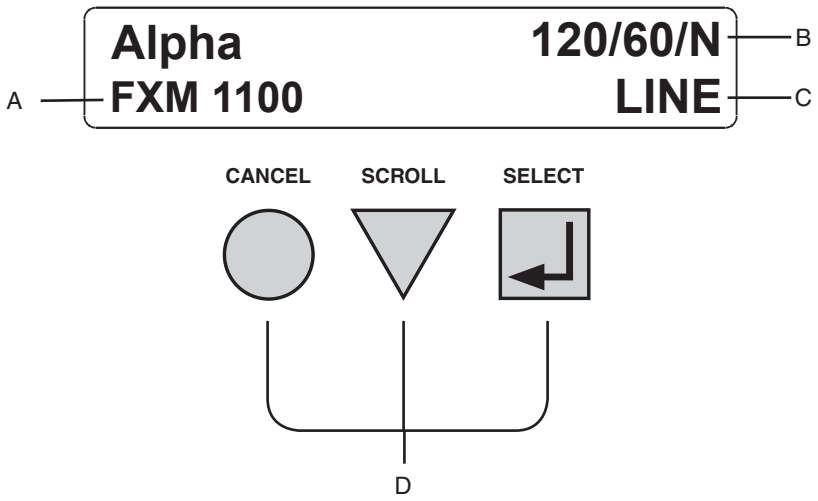


Figure 7.1 – LCD Control Panel (Logo Screen shown)

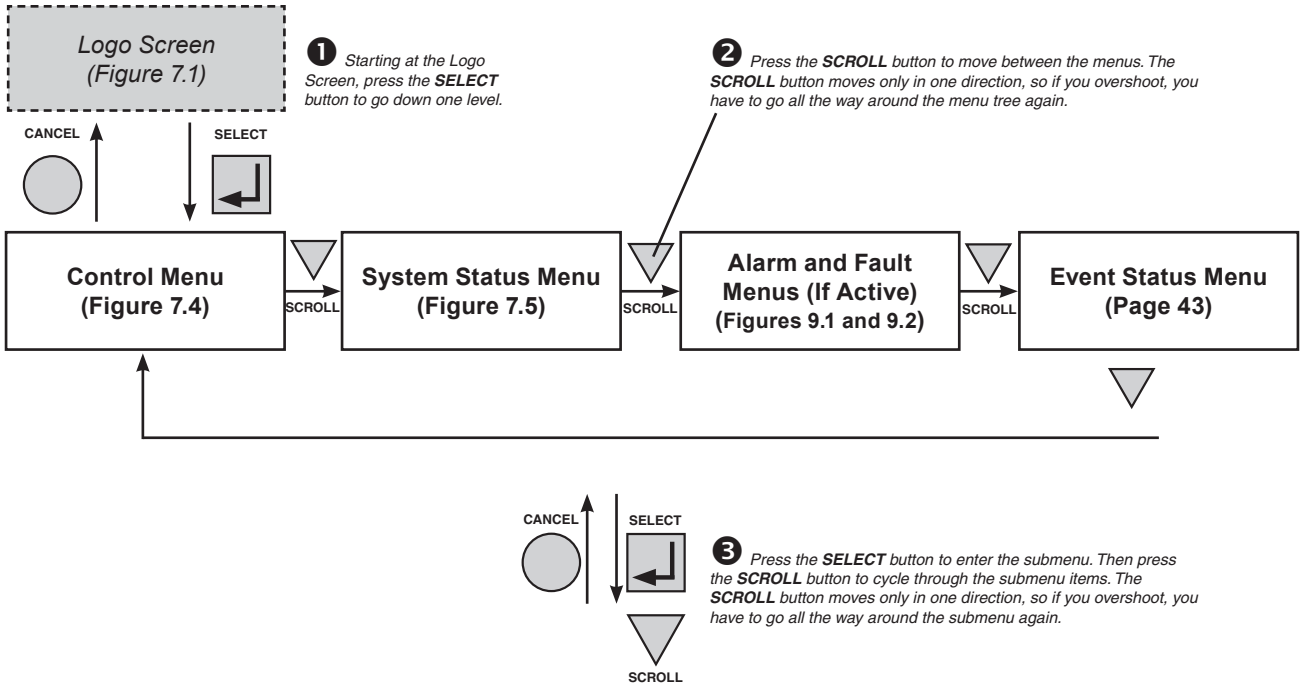
A	**FXM model name**
B	**FXM voltage configuration - 120 VAC or 230 VAC** FXM Frequency - 50 Hz or 60 Hz Sense Type setting - Normal (N) or Generator (G); see "Operating the Novus FXM", Sense Type on page 40..
C	**Present operating mode** - (LINE mode shown) See Figure 7.2.
D	Control buttons: **SELECT -** Pressing SELECT moves you down 1 level in the menu tree (Figure 7.3) or accepts a change when programming (See page 40). **SCROLL** - Pressing SCROLL moves you through the submenus (Figure 7.3) or toggles between choices when programming (See page 40). **CANCEL** - Pressing CANCEL moves you up one level in the menu tree (Figure 7.3).

The FXM’s operating mode automatically changes as a result of changes in the line or the FXM’s operating mode (Figure 7.2. Also see "Specifications, Boost/Buck/Line Transfer Thresholds” on page 89). The LCD panel automatically updates to reflect this.

UPS Operating Modes	
LCD Shows	**Description**
SHUTDOWN	The FXM's inverter is turned off. Line power is disconnected from the load.
LINE	The FXM is turned on. Line power is provided to the load.
BOOST1 OR BOOST2	The FXM's transformer is raising line voltage without using the batteries. AVR is enabled (See page 40).
BUCK1 OR BUCK2	The FXM's transformer is lowering line voltage without using the batteries. AVR is enabled (See page 40).
INVERTER	The FXM is providing backup battery power to the load. Also See Figure 7.4, "Control Menu, INVERTER".
RETRAN	The FXM is transferring from INVERTER mode to Line mode.
TRAN	The FXM is transferring from the state it is now in into Inverter mode.
STANDBY	The FXM is on and waiting for the line power to qualify or the user clear some faults. CAUTION: Do not touch the AC output terminals, which may be still energized.
BYPASS	This mode is manually set with the Control Menu (See Figure 7.4, "Control Menu, INV BYPASS") This locks the unit into line mode and turns off the battery charger so the unit can work with a manual break-before-make bypass switch.

Figure 7.2 – UPS Operating Modes

Pressing the CANCEL, SCROLL and SELECT buttons let you to navigate through the menus and submenus to control, monitor and troubleshoot the FXM as shown in Figure 7.3 below. For a tutorial on how to use these menus, see "Control Panel Tutorial" on page 83.


Logo Screen
(Figure 7.1)
1 Starting at the Logo Screen, press the SELECT button to go down one level.
2 Press the SCROLL button to move between the menus. The SCROLL button moves only in one direction, so if you overshoot, you have to go all the way around the menu tree again.
CANCEL
SELECT
Control Menu
(Figure 7.4)
SCROLL
System Status Menu
(Figure 7.5)
SCROLL
Alarm and Fault
Menus (If Active)
(Figures 9.1 and 9.2)
SCROLL
Event Status Menu
(Page 43)
CANCEL
SELECT
SCROLL
3 Press the SELECT button to enter the submenu. Then press the SCROLL button to cycle through the submenu items. The SCROLL button moves only in one direction, so if you overshoot, you have to go all the way around the submenu again.

The CONTROL MENU (Figure 7.4) lets you control, program and adjust the FXM for connection to traffic intersection equipment or other applications. You can control the:

- **INVERTER**
- **INV BYPASS**
- **BATT TEST**
- **AUTO TEST**
- **SHUTDOWN**
- **SENSE TYPE**
- **FUNC MODE**
- **VOLTAGE**
- **FREQUENCY**
- **QUAL TIME**
- **BATT COMP**
- **DATE SEL**
- **INV RECORD**
- **CHARGE CUR**

The SYSTEM STATUS menu (Figure 7.5) lets you measure various inputs, outputs and other values. The available measurements are:

- **VIN**
- **VOUT**
- **IOUT AC**
- **BATT TEMP**
- **FREQ IN**
- **OUTPUT PWR**
- **BATT VOLT**
- **CHGR CUR**
- **DATE**
- **TIME**
- **INV COUNT**
- **INV TIMER**
- **SHED TIMER 1, 2 OR 3**
- **VERSION**

The ALARM and FAULT menus (Figures 9.1 and 9.2) are invisible and disabled until the FXM has a malfunction.

When the front panel's alarm LED is on or flashing, press SELECT.

One of the malfunctions listed in Figures 9.1 and 9.2 will appear on the LCD. Press the SCROLL button to see if more than one malfunction is present.

Fix the malfunction. Press the SELECT button to clear the malfunction from the screen.

If the malfunction is fixed, the malfunction is cleared from the LCD. If it isn't fixed, it will reappear on the screen.

The EVENT STATUS menu (See page 43) displays the last 25 FXM events on the LCD. For the 100-event log, see page 54.

Press the SELECT button to access the menu. Press the SELECT then the SCROLL button to scroll through the events. To see what a specific event was, press the SELECT button. Press the SCROLL button to see what malfunction triggered the event.

Figure 7.3 - LCD Menu Tree

Turning the Novus FXM On and Off

Under normal operation, the FXM is always powered ON to supply uninterruptible power to the load. By turning off the FXM, the power supply to the load will also be disconnected. If for any reason you need to turn off the FXM while maintaining power to your critical load, make sure that you have a plan in place to provide an alternate source of power.

Turn Off Procedure

1. Turn off the AC input circuit breaker.
2. Turn off the battery circuit breaker. The status LED turns off and the LCD panel goes blank.

The FXM is now turned off and no backup power is supplied to the load.

Turn On Procedure (LINE mode)

Before you put the FXM back into commission, make sure that the line is qualified and the batteries are fully charged.

1. Turn on the battery circuit breaker. The LCD displays **STANDBY** and the fan turns on for about a minute.

Notes

i. If the temperature is below –15°C, the LCD display may not function. See "Troubleshooting" on page 88.

ii. Turn on the AC input circuit breaker. The FXM qualifies the line power. The LCD displays **RETRAN**, then shows **LINE**, **BUCK** or **BOOST**. The status LED turns on.

iii. If there is no line power, the FXM will remain in STANDBY mode until it the line power is qualified. If you need to provide backup battery power to the load, perform a manual start by using the inverter command (See “Operating the Novus FXM Inverter” on page 40).

iv. The FXM has auto-frequency detection. When it is first turned on, it senses the line frequency and adjusts its output frequency to match that of the input (Also see "Specifications" on page 89). The load should be receiving power, If not, perform troubleshooting on page 87.

Switching the FXM from Line mode to Inverter mode

You can also force the FXM to operate in the inverter mode by manually turning off the input circuit breaker. Doing so will effectively disconnect any line power to the FXM, simulating a power outage which triggers the FXM to swtich to the inverter mode of operation.

Procedure

1. Turn off the input circuit breaker. The LCD shows **INVERTER**, the status LED starts flashing to show the FXM is running on backup battery power. Confirm that the load is receiving power.

Switching the FXM from Inverter mode to Line mode

The FXM remains in inverter mode for as long as the input circuit breaker is turned off. Backup power is provided to the load until the batteries are drained to a preset level which triggers the FXM to shutdown automatically. If it is not necessary to operate the FXM in inverter mode, you should switch the FXM back to Line mode as soon as possible.

Procedure

1. Turn on the input circuit breaker. The FXM qualifies the line power. The LCD displays **RETRAN**, then shows **LINE**, **BUCK** or **BOOST**. The status LED turns on.

Note

If the FXM constantly switches between Inverter and Line modes due to a noisy line, the FXM's input parameters should be broadened from normal to generator (See "Operating the Novus FXM, Sense Type." on page 40. Also See Specifications, "Boost/Buck/Line Transfer Thresholds" on page 89).

In generator mode, the range of acceptable input frequency and voltage is expanded to accept the fluctuations created by a generator.

Replacing the Batteries

WARNING

Make sure you have read and understood the battery safety instructions in “Product Safety Information” on page 5.

Caution: Make sure all the replacement batteries are of the same type and rating. Failure to do so could result in improper charging and damage the batteries.

Note

While the batteries are being changed, the FXM cannot provide backup battery power. If the line becomes unqualified while the battery is being changed, the FXM shuts down and no power is provided to the load.

Procedure

1. If the FXM is in Line, Buck or Boost mode (See Figure 7.1) go to the control submenu to switch it into Inverter Bypass (See page 40; see also the Control Panel Tutorial below). If the FXM is not in these modes, wait until the line is qualified before you continue.
2. Turn off the battery circuit breaker.
3. Unplug the battery string.
4. Disconnect the battery cables from the batteries.
5. Connect the battery cables to the new batteries.
6. Plug the battery connector into the FXM.
7. Turn on the battery circuit breaker.
8. Switch the FXM out of Inverter Bypass.

Control Panel Tutorial

From the Logo Screen (Figure 7.1):

1. Press the **SELECT** button once.
   The LCD Screen shows **Control Menus**.
2. Press the **SELECT** button once.
   The LCD screen shows **INVERTER**.
3. Press the **SCROLL** button until the LCD shows **INV BYPASS**.
4. Press the **SELECT** button once.
   OFF is flashing.
5. Press the **SCROLL** button once.
   ON is flashing.
6. Press the **SELECT** button once.
   ON is on solid. The FXM is now switched into **INV BYPASS** and you can replace the batteries.

Operating the Novus FXM

The control menu (Figure 7.4) lets you operate the FXM or program it to suit your operating conditions. You can also use the Novus User Software to make these adjustments (See "Novus User Software" on page 56).

Procedure

1. From the logo screen (See Figure 7.1) go to the Control Menu (See Figure 7.3).
2. Press the **SELECT** button to enter the submenu (See Figure 7.4).
3. Press the **SCROLL** button to move between items in the sub-menu.
4. When you have reached the item you want to change, press the **SELECT** button. The item chosen is blinking.
5. To toggle between the choices, press the **SCROLL** button. Stop when you reach the choice you want.
6. To make the change, press the **SELECT** button. The blinking stops.

Control Menu

LCD Shows	Meaning	Description
INVERTER	**Inverter**	When turned on, this forces the FXM to provide backup battery power to the load. This can only be activated when the FXM is turned on and there is no line power available. ***Also See*** "Adjusting and Controlling the Novus FXM, #31 Inverter On/Off." on page 50.
INV BYPASS	**Inverter Bypass**	This function can only be turned on when the FXM is in line mode. When turned on, this locks the FXM into line mode, turns off the battery charger and makes the output voltage equal to the input voltage. This is done to: Replace the batteries (***See*** page 83). OR Allow the use of a break-before-make manual bypass switch so the FXM can be shut off for maintenance or replacement without interrupting power to the load.
SELF TEST	**Self Test**	This is the FXM's self test. When it is turned on, the FXM is forced to verify its proper operation by providing backup battery power to the load and then switches back to Line mode. The default setting for the run time is 2 minutes, but this can be changed in the RS-232 menus (***See*** "Adjusting and Controlling the Novus FXM #30: Self Test Options" on page 50.).
AUTO TEST	**Automatic Test**	If the GUI's periodic self test is enabled (***See*** page 56), this starts the test no matter when it is scheduled to take place.
SHUTDOWN	**Shutdown**	When this function is turned on, the FXM's inverter is shut off. The line is disconnected from the load, so no line power is provided to it.
SENSE TYPE	**Sense Type**	This function can only be used when the FXM is in Standby or Shutdown mode (See Figure 7.2). This function toggles between: NORMAL: The FXM can operate successfully with most line conditions. or GENERATOR: The FXM's input voltage and frequency parameters are expanded so the FXM can work with the fluctuations caused by a generator or noisy line.

Control Menu		
LCD Shows	**Meaning**	**Description**
FUNC MODE	**Functional Mode**	The functional mode can only be changed when the FXM is in Standby or Shutdown mode (See Figure 7.2. Also See Specifications, “Boost/Buck/Line Transfer Thresholds” on page 89). This function toggles between: AUTOMATIC VOLTAGE REGULATION (AVR): The buck and boost modes are active. OR QUALITY: The buck and boost modes are turned off, the input voltage is the FXM’s output voltage. If you are connecting an Alpha Technologies Automatic Transfer Switch (ATS) to traffic intersection equipment, then you MUST switch the FXM to quality since most traffic equipment cannot handle the high voltage output of the FXM when it is in AVR mode.
VOLTAGE	**Voltage**	This lets you set the FXM’s output voltage setting to 120VAC, 230VAC or 220VAC. This should ONLY be done by a qualified technician acting under the instructions of Alpha Technologies customer service department. Failure to contact Alpha technologies before doing this procedure could result in voiding of the warranty.
FREQUENCY	**Frequency**	The frequency can only be changed when the FXM is in Standby mode. This lets you set the FXM’s frequency setting to 50Hz or 60Hz. This should ONLY be done by a qualified technician acting under the instructions of Alpha Technologies customer service department. Failure to contact Alpha technologies before doing this procedure could result in voiding of the warranty.
QUAL TIME	**Line Qualify Time**	This lets you set how long it takes for the FXM to return to Line mode after the line has become requalified to make sure the line is stable. It can be set to 3, 10, 20, 30, 40 or 50 seconds. The factory default setting is 3 seconds. Also See “Adjusting and Controlling the Novus FXM, #34: Line Qualify Time.” on page 50.
BATT COMP	**Battery Temperature Compensation**	This lets you set the battery temperature compensation to match the batteries you are using. It can be set to -2.5, -4, -5 or -6 mV/°C/Cell. The factory default setting is -5 mV/°C/Cell.
DATE SEL	**Date Format Selection**	This lets you toggle the FXM’s date format between YY-MM-DD or MM-YY-DD, DD-MM-YY, YYYY-MM-DD, MM-DD-YYYY OR DD-MM-YYYY. The factory default setting is MM-DD-YY.
INV RECORD	**Inverter Record Clear**	This clears the inverter counter and timer from the LCD’s system status menu (See page 43). This does not clear the 100-event log in the RS-232 menus (See page 54).
CHARGE CUR	**Charger Current**	This allows you to set the battery charger current to either 0A, 3A, 6A or 10A. NOTE: If you set the battery charger to 0A, you will turn the charger off.

Figure 7.4 – Control Menu

Making Measurements

The System Status Menu (Figure 7.5) lets you make measurements of various FXM inputs, outputs, temperatures and other values. You can also use the Novus User Software to make these measurements (See “Novus User Software” on page 56).

Procedure

1. From the logo screen (Figure 7.1) go to the system status menu (Figure 7.3).
2. Press the SELECT button to enter the submenu (Figure 7.5).
3. Press the SCROLL button to move between items in the sub-menu. When you reach the item you want to measure, stop pressing the button. The measurement is automatically displayed on the LCD. It is automatically updated every 0.5 second.

System Status Menu

LCD Shows	Meaning	Description
VIN	**Input Voltage**	The line input voltage into the FXM.
VOUT	**Output Voltage**	The FXM’s output voltage (true RMS).
IOUT AC	**Output Current (AC)**	The FXM’s AC output current (true RMS).
BATT TEMP	**Battery Temperature**	The battery’s temperature (°C).
FREQ IN	**Input Frequency**	The frequency of line power into the FXM (Hz).
OUTPUT PWR	**Output Power**	The FXM’s output power in VA (true RMS).
BATT VOLT	**Battery Voltage**	The battery’s output voltage (VDC).
CHGR CUR	**Charger Current**	The FXM’s battery charging current is set to this value (Amps).
DATE	**Date**	The date and time (24 hour clock).
TIME	**Time**	
INV COUNT	**Inverter Count**	The number of times the FXM was in inverter mode.
INV TIMER	**Inverter Time**	The total amount of time the FXM was in inverter mode.
SHED TIMER1	**Amount of time until the dry contact is activated.**	The factory default dry contact for this setting is contact C4. SHED TIMER2 and SHED TIMER3 can be field programmed (See “Setting the Timer Contact” on page 52). This display shows the amount of time left (in seconds) until the contact is activated. The factory default setting is 2 hours, but this can be changed as shown in Figure 7.15.
SHED TIMER2		
SHED TIMER3		
VERSION	**Software Version**	The software version used in this FXM.

Figure 7.5 – System Status Menu

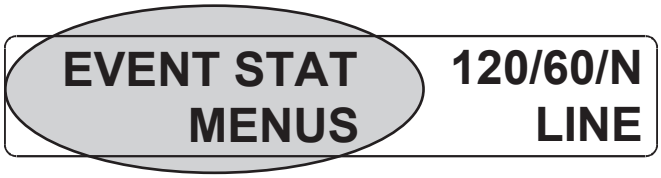
Viewing the 25-Event Log

The event menu displays on the LCD the last 25 events the FXM went through and the malfunction that triggered it. If more than 25 events occur, the oldest is overwritten. To clear this log, see “Operating the Novus FXM, INV RECORD.” on page 40.

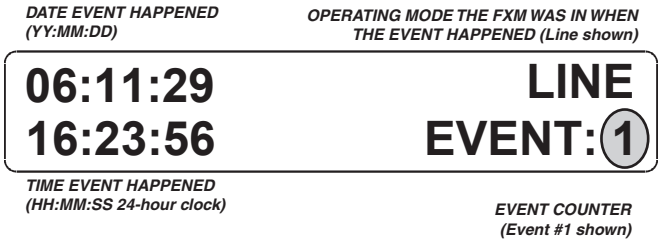
To see the last 100 events, go to the RS-232 100-event log (See “100-Event Log” on page 54 or “Novus User Software, Event History.” on page 76.)

Procedure

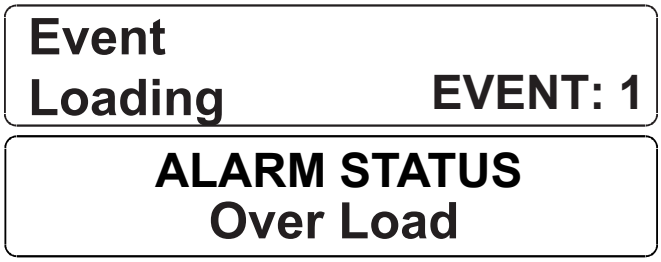
1. From the Logo Screen (Figure 7.1), navigate to the **EVENT STATUS MENU** (Figure 7.3).



2. Press the **SELECT** button to enter the submenu.
3. The following log screen appears.



4. Press the **SELECT** button. The event counter flashes.
5. Press the **SCROLL** button to scroll through the event counter.
6. When you reach the event you want press the **SELECT** button.
7. The event loading screen appears and then the log screen reappears with the details for that event.



8. Press the **SCROLL** button. One of the faults or alarms shown in Figure 9.1 or 9.2 is displayed and it is the malfunction that triggered the event.

Communicating with the RS-232 interface

The following subsections describe the operation of the Novus FXM via the RS-232 interface.

- Wiring the RS-232 Port on page 45.
- Using the Main Menu on page 46.
- Adjusting and Controlling the Novus FXM on page 50.
- Programming the Dry Contacts and the Clock on page 51.
- 100-Event Log on page 54.
- Installing and Using the "Novus User Software" on page 56.

Wiring the RS-232 port

The FXM's front panel has a DB-9 female connector. When connected to a PC with Windows HyperTerminal or other terminal emulation software, the FXM can be remotely monitored and controlled with it's command-line system. The Novus User Software provides a Windows or web browser type of control.

Procedure

1. Connect a 9-pin, fully shielded, straight-through DE-9 to DE-9 connector cable between the computer's port and the FXM's port.

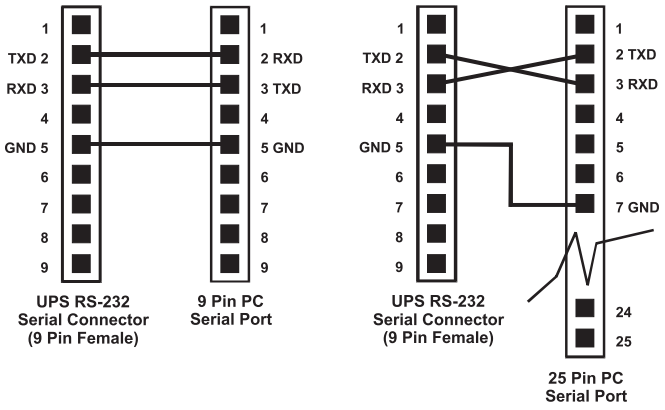


Figure 7.6 – RS-232 pin connections

2. Configure the communications parameters to the values shown in the terminal set up table below.

Terminal Set Up Table			
Emulation Type	VT 100 or Compatible	Backspace	N/A
Duplex Mode	Half Duplex	Break Length	N/A
Xon/Xoff Flow Control	None	Emulation Type	N/A
RTS/CTS Flow Control	Off	**Communication Parameters**	
Line Wrap	On	Handshaking	Software Handshaking
Screen Scroll	On	Baud Rate	2400 bps
CR Translation	CR	Data Format	8 Data, No Parity, 1 Stop Bit

Figure 7.7 – Terminal Set Up Table

Using the Main Menu

The FXM's main menu screen runs on a command line system (Figure 7.8). This program does not recognize the backspace or delete keys even if appears that way on the monitor. If you make a mistake and press **Enter**, the FXM echoes the command back exactly as you typed it. Press **Enter** and retype the command again.

If you choose not to use the command line system, you can use the Novus User Software to control and monitor the FXM (See page 56).

Main Menu Screen

The main menu screen (Figure 7.8) shows the FXM's current input and output values, displays if any faults or alarms are present and gives access to the submenus. It can be accessed from anywhere in the menu tree (Figure 7.9) by typing **0** and pressing **Enter**. The FXM is controlled by submenu 3.

To access a particular submenu, type in the submenu number and press **Enter**. To update the main menu screen, press **Enter**.

The complete menu tree is given in Figure 7.9. Tables describing the Line Status, Output Status, Faults and Alarms displays are given in Figure 7.10, 7.11 and 7.12 respectively.

Notes

i. The readings on the main menu screen do not automatically update to reflect changes in the FXM's status. Press **Enter** to update the screen.

ii. For many functions you need to enter a password. The factory setting is 1111.

Submenu Numbers (Figure 7.9)

Status, Faults and Alarms Displays (Page 48 & 49))

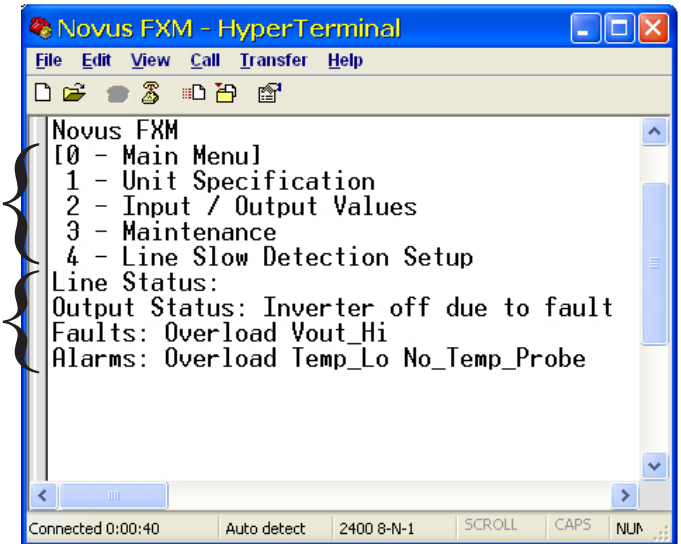


Figure 7.8 – Main Menu Screen

RS-232 Menu Tree

Submenus #1, 2 and 4 are read-only screens for monitoring the FXM. To control the FXM, use submenu #3, the Maintenance submenu

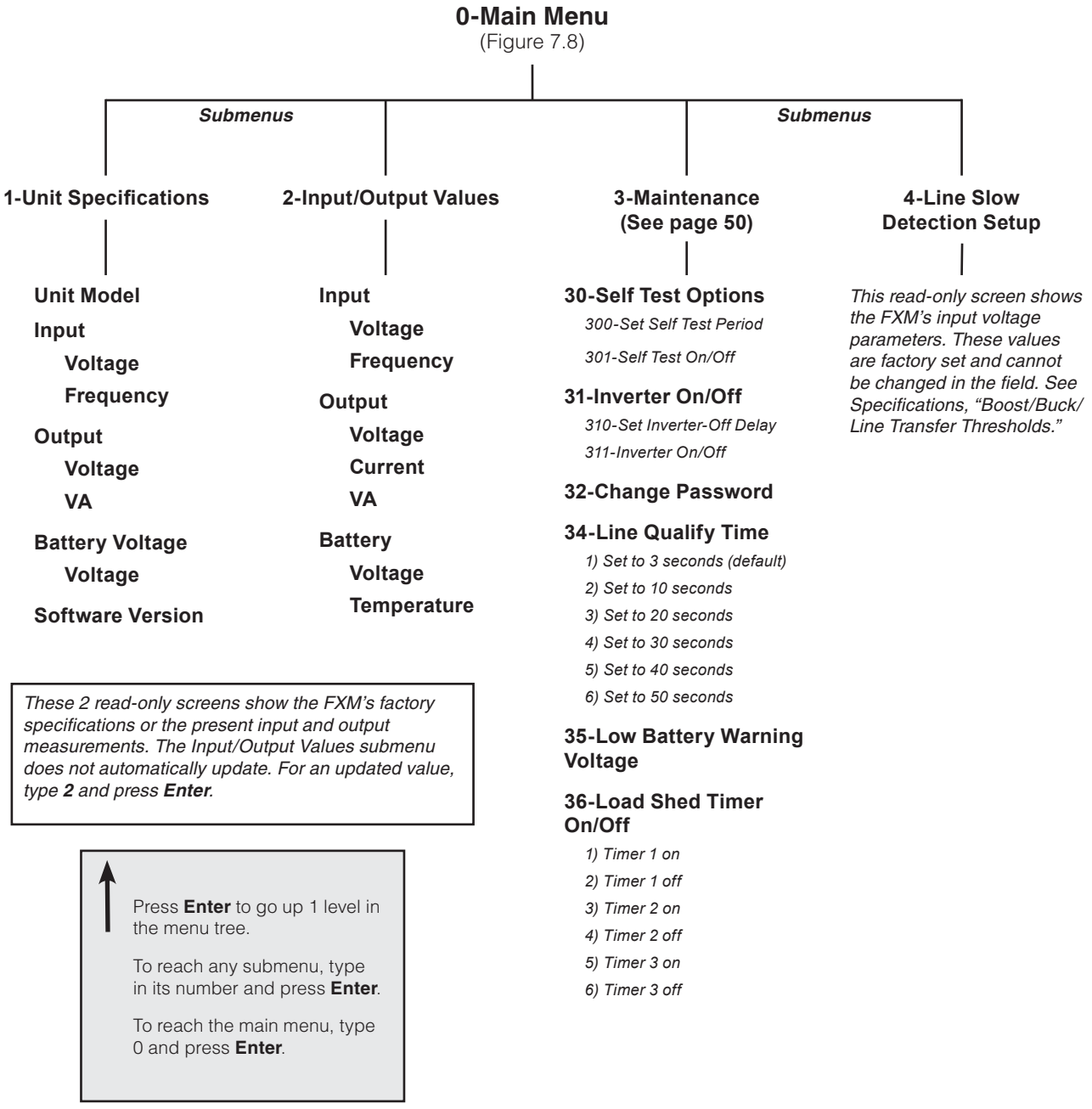


Figure 7.9 – RS-232 Menu Tree

Line Status

Line status tells you the line's condition (See also Figure 7.2 on page 35). For an updated value, press **Enter**.

Line Status	
Normal	The line is within specifications (*See* specifications, "Boost/Buck/Line Transfer Thresholds"). The FXM is operating in Line mode.
Boost	Line voltage is out of tolerance. The FXM is operating in Boost mode.
Boost2	Line voltage is out of tolerance. The FXM is operating in Boost 2 mode.
Buck	Line voltage is out of tolerance. The FXM is operating in Buck mode.
Buck2	Line voltage is out of tolerance. The FXM is operating in Buck 2 mode.
Blackout	The line is absent.
Freq low	Line frequency is too low.
Freq high	Line frequency is too high.

Figure 7.10 – Line Status

Output Status

Output status tells you how the FXM is producing power (See also Figure 7.2 on page 35). For an updated value, press **Enter.**

Output Status
Line mode
Battery mode
Battery mode, low bat. warning
Battery mode (testing battery)
Boost mode
Boost 2 mode
Buck mode
Buck 2 mode
Hot swap mode
Inverter off due to fault
Inverter off due to low battery
Inverter off at start-up
Shutdown due to user request

Figure 7.11 – Output Status

Fault and Alarm Displays

Fault and alarm displays any malfunctions the FXM has encountered. (Also see "Troubleshooting" on page 87).

Faults	
Short_Circuit	The load has a short.
Vout_Hi	The output voltage is above specifications.
Batt_Hi	The batteries cannot be charged.
Batt_Lo	The batteries are almost discharged.
Vout_Lo	The output voltage is below specifications.
Overload	The FXM is overloaded. Remove excess loads.
Backfeed	A relay inside the FXM has failed and it cannot be replaced in the field. Contact Alpha Technologies customer service department.
Bad_Battery	The battery voltage has dropped below a specified level. Inverter shuts down.
Temp_Hi	The FXM is operating above temperature range.
Alarms	
Overload	The FXM is overloaded. Turn off excess loads.
Temp_Hi	The ambient battery temperature is too high.
Temp_Lo	The ambient battery temperature is too low.
User_Input	The user input contact (*See* "User Input: S2" on page 17) is shorted.
Line_Freq	The line frequency is outside of the FXM's input specifications.
No_Temp_Probe	The battery temperature sensor has become disconnected or has failed.
Weak_Battery	The battery has failed the background scan in Line mode.
Batt_Low	The battery voltage is low.
Batt_Brkr_Open	The battery breaker is opened.
Self_test	The FXM is performing self test.
Fan_Fail	The FXM internal fan has failed.

Figure 7.12 – Fault and Alarm Displays

Adjusting and Controlling the Novus FXM

The Maintenance submenu (Figure 7.13) lets you control the FXM and change selected items to meet your operational needs.

Procedure

At the main menu (Figure 7.8) type **3** and press **Enter**.

Maintenance Submenu	
30 Self Test Options	This starts the self test and sets for how long it will run. The default setting for the test duration is 2 minutes, but this can be adjusted in 1 minute intervals. ***Also See*** "Operating the Novus FXM, SELF TEST." on page 40.
31 Inverter On/Off	This switches the inverter on or off to allow you to prevent a damaging deep battery discharge or to provide backup battery power to the load. ***Also See*** "Operating the Novus FXM, INVERTER." on page 40. You can set a delay before the inverter turns off to allow time for turning off critical loads. The Set Inverter ON/OFF delay is only available when the FXM is in Battery or Standby modes. The delay can be adjusted in 1 second steps with a default setting of 0 seconds to a maximum of 600 seconds (10 minutes). The delay is only available in Standby or Battery modes. Once the FXM returns to Line mode, the delay resets itself to 0 seconds.
32 Change Password	This changes the FXM's password. The factory set password is 1111. It can only be changed when the when the FXM is in Line mode. The password is limited to 4 alpha-numeric characters in length.
34 Line Qualify Time	This lets you set the delay when the FXM goes from Battery mode to Line mode after the line becomes requalified. The purpose of this delay is to make sure the line is stable before the FXM switches back to it. ***Also See*** "Operating the Novus FXM, QUAL TIME." on page 40. The default setting is 3 seconds, but you can set this to 3, 10, 20, 30, 40 or 50 seconds.
35 Low Battery Warning Voltage	The lets you set the FXM's low battery warning voltage, adjusting the setting to match the batteries you are using and the actual operating conditions. The default value is 40% (47 VDC) and can be adjusted in 1% (0.05 VDC) increments between 45.0 (0 %) and 50.0 VDC (100%) by typing in the % battery voltage level where you want the warning to be triggered at.
36 Load Shed Timer On/Off	This lets you turn the timer contacts on or off (See "Contacts C1 to C6" on page 16).

Figure 7.13 – Maintenance Submenu

Programming the Dry Contacts and the Clock

The FXM's front panel contacts (See "Contacts C1 to C6" on page 16) can be programmed to meet your specifications with RS–232 communications. You can also adjust the FXM's date and time.

Programming the Dry Contacts

The functions of dry contacts C1 to C5 (and if factory configured, dry contact C6) can be changed with RS-232 communications.

For example, to change contact C1:

1. To see how it is currently programmed, type **c1** (all lower case) and press **Enter**.
2. The FXM responds with ***c1=1** where the ***** shows the unit responded to your command.
   For example: a "**1**" shows it is programmed to be the **On Battery** indicator as shown in the Dry Contact Configuration table below.

Dry Contact Configuration		
1= On Battery	**4= Alarm**	**7= Timer 2**
2= Low Battery	**5= Fault**	**8= Timer 3**
3= Timer 1	**6= Disabled**	**9= 48VDC (Only available for contact C6)**

Figure 7.14 – Dry Contact Configuration

3. To change the contact, type **c1=X** where X is 1 to 9 and press **Enter**.
   The FXM responds with ***c1=(1 to 9)**. The programming is done for that contact. Repeat as necessary for the other contacts.

Note

Each contact can only be programmed for one function at a time; it cannot show multiple conditions.

4. To reset the contacts to the factory default, type **default** and press **Enter**. The FXM responds with ***default**, showing it is reset. This command also resets the timer setting to the 2 hours factory default (***See*** "Setting the Timer Contact" on page 52). See "Specification" on page 89 for the factory default settings of dry contacts C1 to C6.

Setting the Timer Contact

The front panel's timer contact (See "Contacts C1 to C6" on page 16 and "Programming the Dry Contacts and the Clock" on page 51) can be programmed to suit your application. Figure 7.15 explains how.

	Enter command	UPS display	Description
Displaying the Timer	**timer** and press **Enter**	*timer=02:00:00	Returns the value of timer1
	timer1 and press **Enter**	*timer1=02:00:00	Returns the value of timer1
	timer2 and press **Enter**	*timer2=02:00:00	Returns the value of timer2
Setting the Timer	**timer=00:01:00** and press **Enter**	*timer=00:01:00	Sets the value of timer1 to 60 seconds.
	timer=120† and press **Enter**	*timer=120	
	timer1=00:01:00 and press **Enter**	*timer1=00:01:00	Sets the value of timer1 to 60 seconds.
	timer1=120† and press **Enter**	*timer1=120	
	timer2=00:01:00 and press **Enter**	*timer2=00:01:00	Sets the value of timer2 to 60 seconds.
	timer2=120† and press **Enter**	*timer2=120	
	default and press **Enter**	*default	Resets the timer to the factory default of 02:00:00 (2 hours); and resets contacts C1 to C5 to the factory default settings.(See "Programming the Dry Contacts" on page 51)

Note: In the above example, the default timer setting of 2 hours is used.
* Indicates that the FXM has responded to the command you entered.
† Time can be entered in units of 0.5 second; e.g. 120 units of 0.5 seconds = 60 seconds. However, it is more intuitive to enter time in the hh:mm:ss format, such as 00:01:00 for 1 minute or 60 seconds in the above example.

Figure 7.15 – Setting the Timer Contact

Setting the Date and Time

See Figure 7.16 below.

Enter command	UPS display	Description
clock and press **Enter**	*clock=12/31/07 22:00:00	Returns the current date and time.
clock=010107 ␣ 120000 and press **Enter**	*clock=01/01/07 12:00:00†	Sets the date and time to Jan 01, 2007, 12:00pm.

Notes:

1. Time is displayed in the 24 hours clock format.
2. Changing the mm/dd/yy format with DATE SEL on the LCD Control Menu (Figure 7.4) does not change the RS-232 mm/dd/yy format.
3. If the FXM has been in storage or turned off for a prolonged period of time, the backup Lithium coin battery could be drained and might not correctly keep a backup of the date and time you entered. After turning on the FXM, go to check the date and time settings; the FXM should display the current date and time; if it displays the date as "00:01:00", then the battery is spent and you need to ask a qualified service personnel to replace the lithium coin battery. See "Troubleshooting" on page 88.

* Indicates that the FXM has responded to the command you entered.

† If the date or time change is invalid, the FXM will return the time and date it was set to before you tried making the change. The date and time must be entered as one complete line command; you cannot change only the time or the date alone, both must be set at the same time. If you make a mistake, press **Enter** and try again.

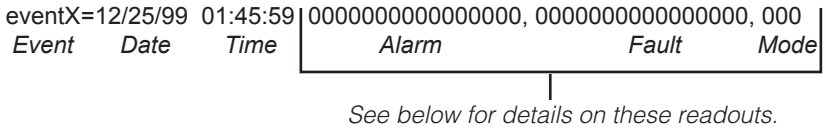
Figure 7.16 – Setting the Date and Time

100-Event Log

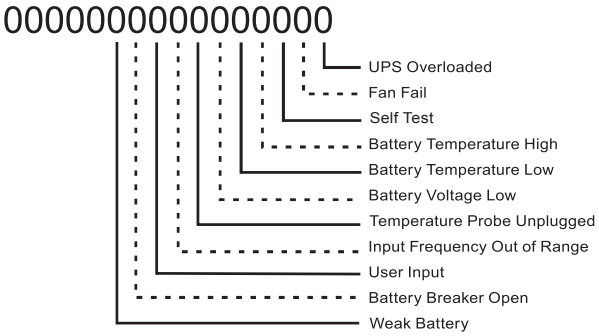
Up to 100 events are stored in the FXM's log. If more than 100 events occur, the oldest is over written.

Procedure

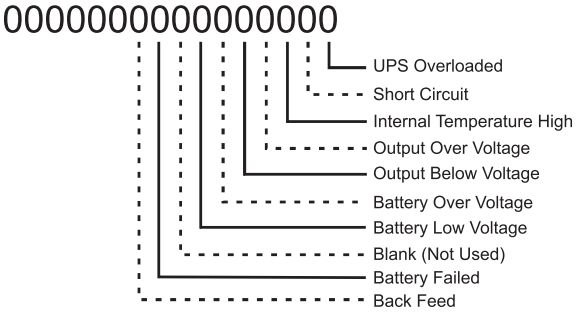
1. To see the log, type **event** (all lower case) and press **Enter**. The events are listed starting with the most recent and appear as:



Alarm: When the following bits show a 1, it is displaying the following alarms.



Fault: When the following bits show a 1, it is displaying the following faults.



Code	Mode	Code	Mode	Code	Mode
000	Standby	003	Boost 1	006	Inverter
001	Line	004	Buck 1	009	Shutdown
002	Boost 2	005	Buck 2	010	Bypass

2. If less than 100 events occurred, the last entry will appear as:

   eventX=00/00/00 00:00:00 0000000000000000, 0000000000000000, 000

3. To clear the log, type **eventclr** and press **Enter**. It takes the FXM 30 seconds to clear the log. Do not enter any other commands during this time.
4. To see a specific event, type **eventX** where X is from 1 to 100 and press **Enter**. To see a range of events (for example, events 20 to 30), type **eventX-X** where X are events from 1 to 100 and press **Enter**.

Novus User Software

Introduction

The Novus User Software Graphical User Interface (GUI) provides Web or Windows© like computer communications with the FXM. The screen and its features are shown below in Figure 7.17. With it you can monitor, control and set various parameters like the date and time, when the weekly self test is run, change the relay configurations, etc. The Fault or Alarm indicators show you if the FXM has a malfunction and what it is. Descriptions of all the screens and their functions are given in “Operation” on page 59.

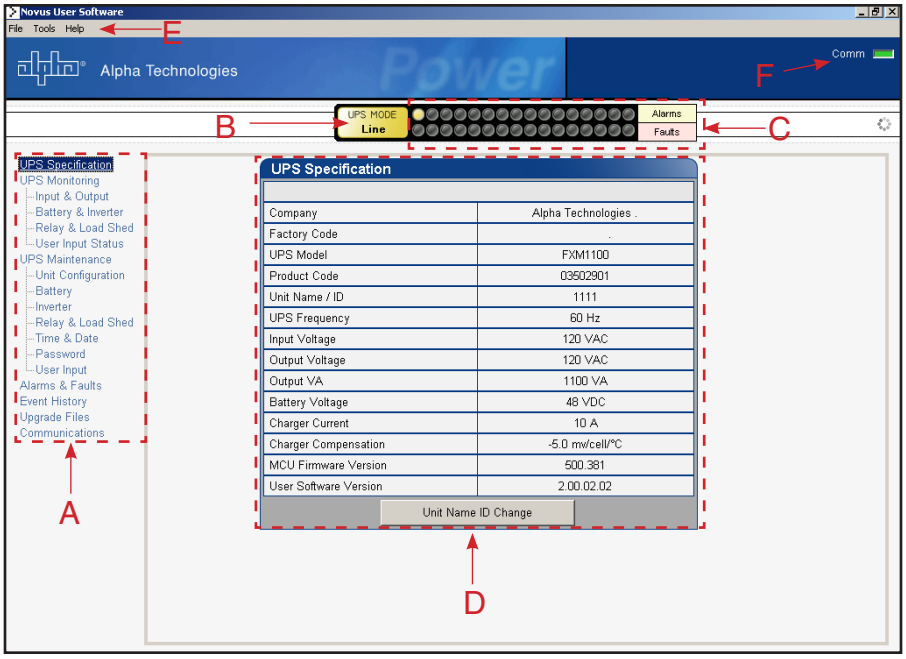


Figure 7.17 – Novus User Software (UPS Specification Screen shown)

A	Screen Selection Menus
B	Current UPS operating mode (Figure 7.2). This is updated automatically
C	Fault and Alarm Indicators – when a light in this bar is on, move the mouse cursor over the light to learn what the malfunction is. Double-clicking on the light will send you to the Alarms & Faults screen.
D	Readout Screens
E	Drop-down Menus
F	Online Indicator

Checking Your Windows Computer for the .NET Framework

1. Click on the **Start** button.
2. Go to **Settings**. Click on it.
3. Click on **Control Panel**.
4. Double-click on the **Add or Remove Programs** icon.
5. When the window shown in Figure 7.18 appears, scroll through the list of applications. If you see Microsoft .NET Framework listed, the Framework is already installed and you can install the Novus User Software. If you don't see it listed, you MUST install it from the Microsoft Windows update web site before installing the software.

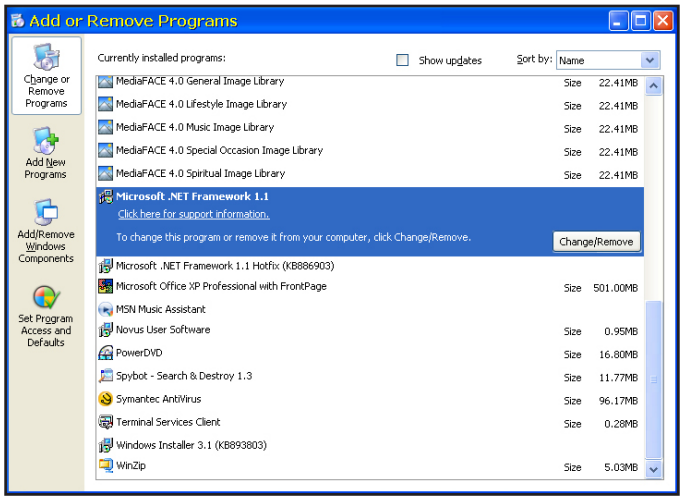

Add or Remove Programs
Currently installed programs:
Show updates
Sort by: Name
Change or Remove Programs
Add New Programs
Add/Remove Windows Components
Set Program Access and Defaults
MediaFACE 4.0 General Image Library Size 22.41MB
MediaFACE 4.0 Lifestyle Image Library Size 22.41MB
MediaFACE 4.0 Music Image Library Size 22.41MB
MediaFACE 4.0 Special Occasion Image Library Size 22.41MB
MediaFACE 4.0 Spiritual Image Library Size 22.41MB
Microsoft .NET Framework 1.1
Click here for support information.
To change this program or remove it from your computer, click Change/Remove.
Change/Remove
Microsoft .NET Framework 1.1 Hotfix (KB886903)
Microsoft Office XP Professional with FrontPage Size 501.00MB
MSN Music Assistant
Novus User Software Size 0.95MB
PowerDVD Size 16.80MB
Spybot - Search & Destroy 1.3 Size 11.77MB
Symantec AntiVirus Size 96.17MB
Terminal Services Client Size 0.28MB
Windows Installer 3.1 (KB893803)
WinZip Size 5.03MB

Figure 7.18 – Add or Remove Programs Window

Note

If you are downloading from Microsoft's web site, you must have an Internet web browser (e.g. Internet Explorer, Firefox) installed on your computer. In addition to installing .NET, downloading from the web site updates your computer with all the latest security updates. If your computer is part of a company network, check with your network administrator before downloading software from the Internet.

Installation and Set Up

You will need the following tools and materials:

- Novus User Software (available for download from www.alpha.com).
- Windows 98 or later with Microsoft's .NET framework installed.
- DB–9 serial straight-through computer cable.

Procedure

1. Install the Novus User Software onto your computer. Restart the computer.

Note

If you install the Novus User Software on a version of Windows without the .NET framework installed, you will get an error message saying the framework is not installed. Install the framework onto your computer according to the instructions given on page 57. Restart your computer and then try to install the Novus User Software again.

2. Connect the computer cable from any available communications port on your computer to the RS–232 port on the FXM's front panel (See "Wiring the RS-232 Port" on page 45).
3. Set the communications parameters on your computer to:
   - COM Port: The COM port on your computer you have selected to use.
   - Baud Rate: 2400.
4. To start communications between the computer and the FXM, do one of the following:
   a. Click on the screen's Online Indicator (See Figure 7.17), or
   b. In the **File** drop-down menu, click on **Connect to FXM**.

   If the computer cannot to connect to the FXM, a pop up screen appears asking you to check the wiring and that you are connected to the proper com port.

Operation

The various screens are described on the following pages and operate like Web or Windows-type screens. Point and click to change the various functions or fields.

The on line indicator shows if you are connected to the FXM. The Novus User Software automatically polls the FXM to obtain its status. The default setting is polling once every 3 seconds, but you can change this in the **UPS Maintenance-Unit Configuration** screen in the "**Status Refresh Time**" menu.

If a light or lights are on in the Fault or Alarm fields the FXM has a malfunction (See "Troubleshooting" on page 87). Hover your mouse cursor over the light to learn the type of malfunction or double-click on it to go straight to the Alarms & Faults screen.

To control the unit or change it's settings or parameters, either click on the On/Off buttons, or choose an item from a drop down menu. Then click on the **Update Settings** button.

Note

If you do not click on this button, the change will not happen.

- UPS SPECIFICATIONS

This screen displays the various specifications of the FXM.

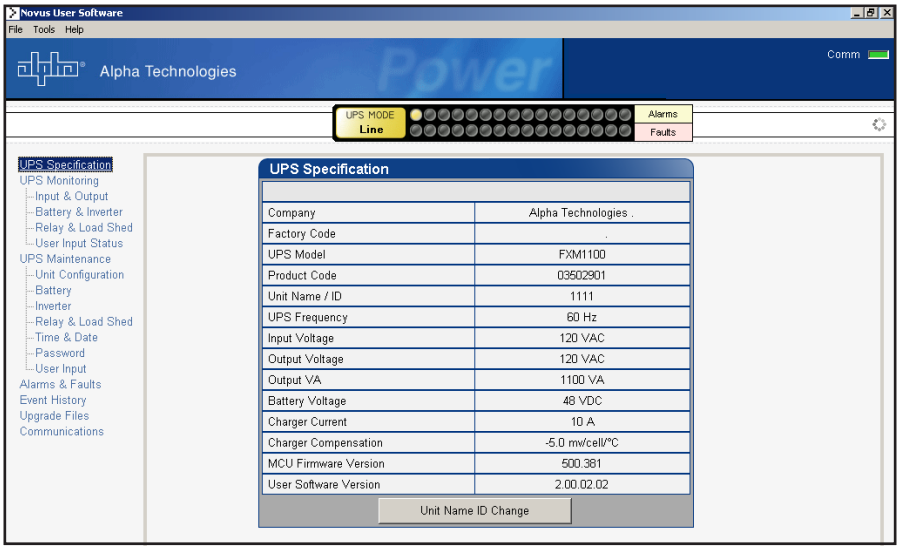


Figure 7.19 – Novus User Software: UPS Specification screen

■ UPS MONITORING

These read-only screens show the FXM's current input and output values and other measurements.

Input & Output: This shows you the current line input and FXM output values and the FXM's present operating mode.

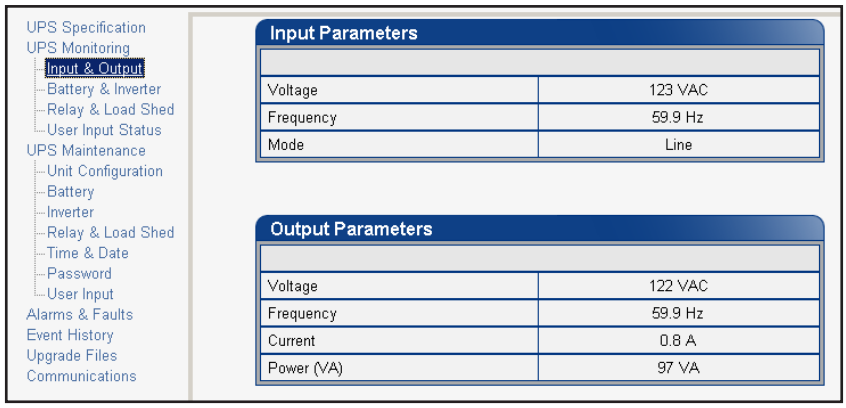


Figure 7.20 – UPS Monitoring: Input & Output screen

Battery & Inverter: This shows you the battery string's status as well as how many times and for how long the inverter has been active.

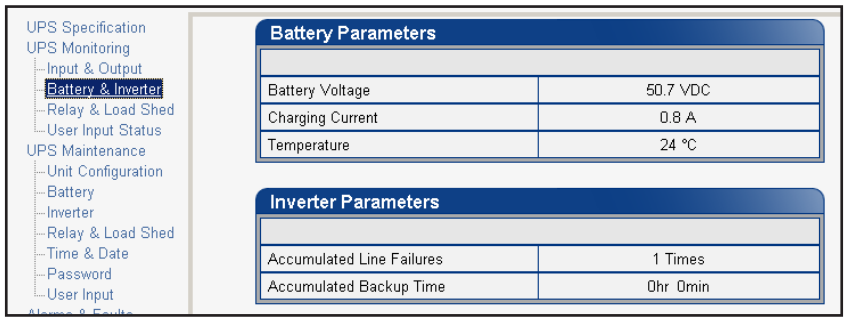


Figure 7.21 – UPS Monitoring: Battery & Inverter screen

Relay & Load Shed: This shows you how the front panel dry contacts are configured. If any relays are used for load shedding, it shows the time they are set to.

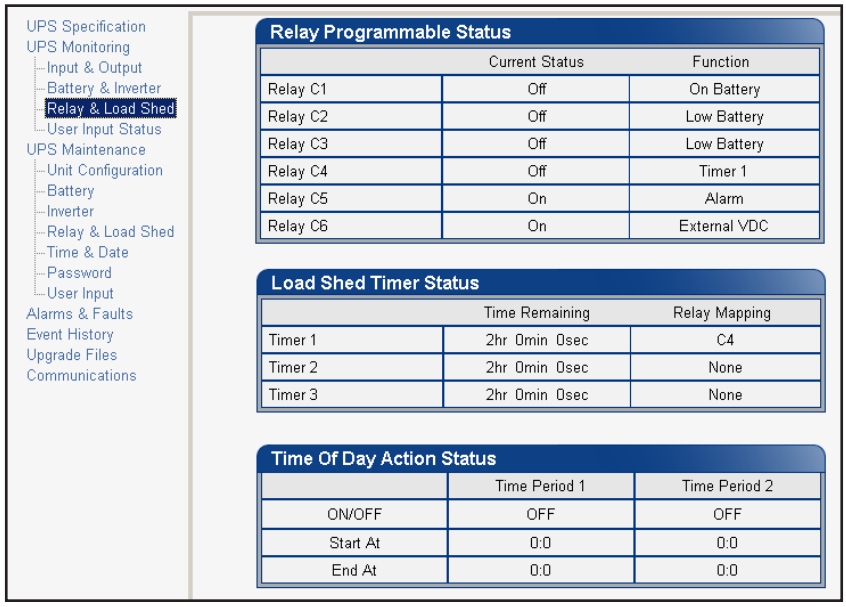


Figure 7.22 – UPS Monitoring: Relay & Load Shed screen

User Input Status: This shows you the current status of the user programmable inputs (1 to 3).

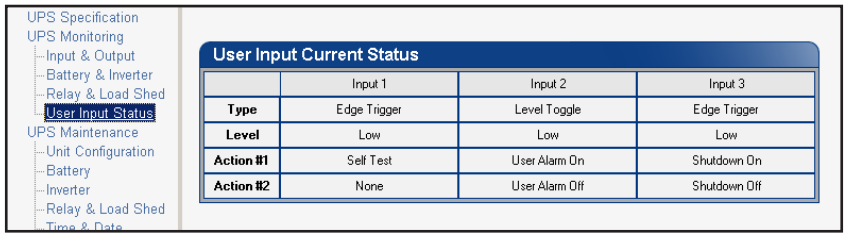


Figure 7.23 – UPS Monitoring: User Input Status screen

■ UPS MAINTENANCE

These screens let you configure and adjust the FXM to meet your operating needs. To change any parameter, either click on the **On/Off** buttons, or choose an item from a drop down menu. To execute the changes, click on the **Update Settings** button. If you do not click the button, the changes will not happen.

Unit Configuration: This lets you set the name, input, output and how often the GUI polls the FXM.

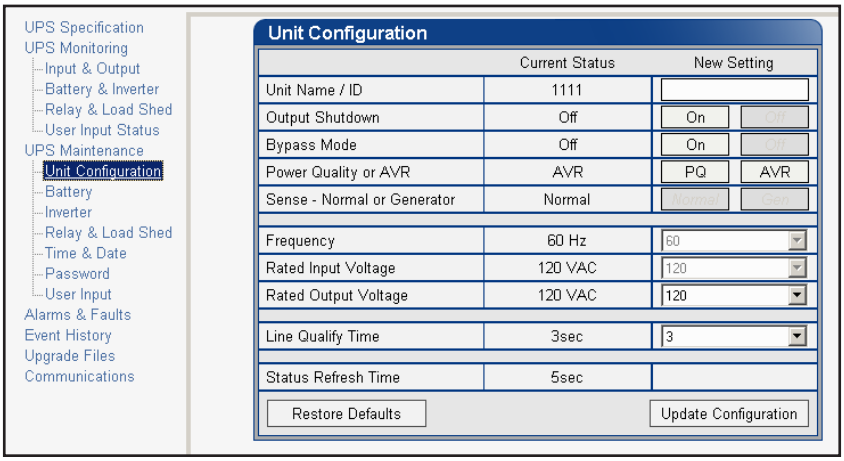


Figure 7.24 – UPS Maintenance: Unit Configuration screen

Battery: This lets you set the battery string voltage, charging parameters, when the low battery warning happens, starts the self test and sets when the periodic self test.

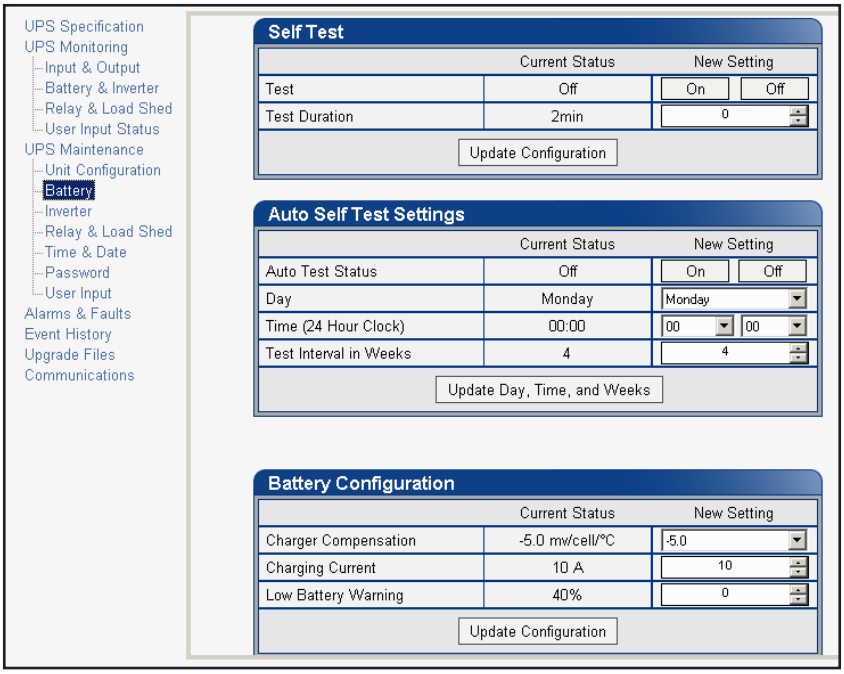


Figure 7.25 – UPS Maintenance: Battery screen

Inverter: This lets you turn the inverter on or off to start or stop backup battery power to the load.

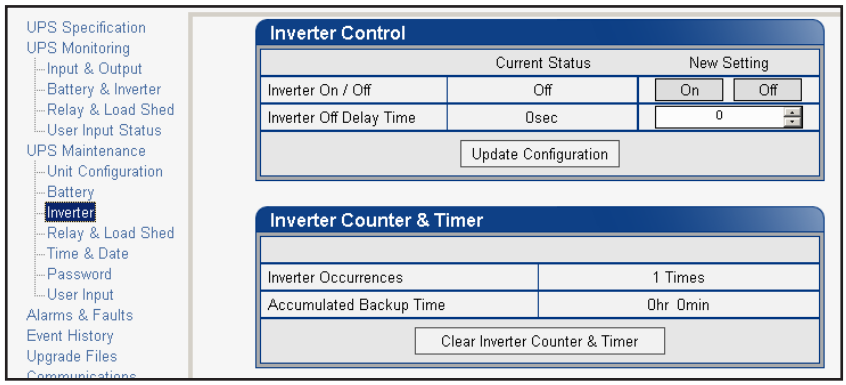


Figure 7.26 – UPS Maintenance: Inverter screen

Relay & Load Shed: Allows you to configure the front panel's dry contact configuration.

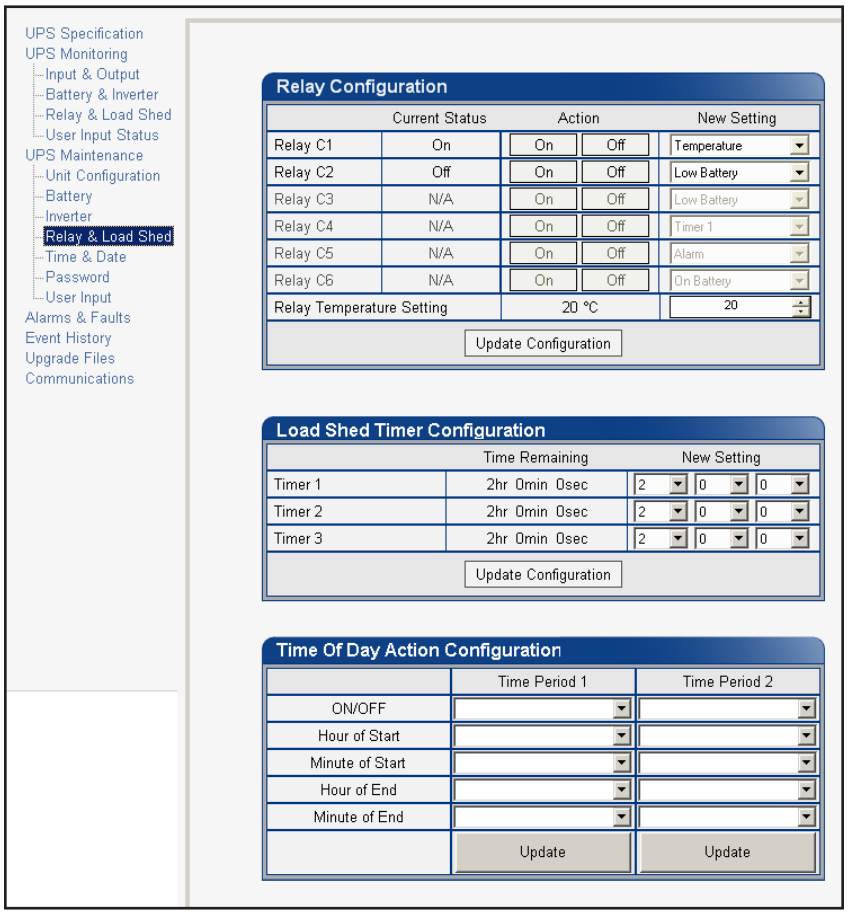


Figure 7.27 – UPS Maintenance: Relay & Load Shed screen

Controlling the external fan by temperature triggered dry contact

The Novus FXM has up to 6 dry contacts (C1 to C6) on the front panel which can be configured by the user to open (or close) based on the specific trigger conditions. Dry contact functions currently available include: Alarm, Fault, Timer, Low Battery, On Battery, etc. The Temperature trigger has been added as a new function, with a user configurable range of +20°C to +55°C. When the battery temperature (monitored by the Battery Temperature Probe) reaches the threshold, the assigned relay closes and turns on the external fan.

Note

Dry contact C6 is by default factory hard wired to External VDC. If you need to configure C6 as a programmable dry contact, the unit must be sent back to the factory.

The Temperature trigger can be programmed via one of the following 3 interfaces:

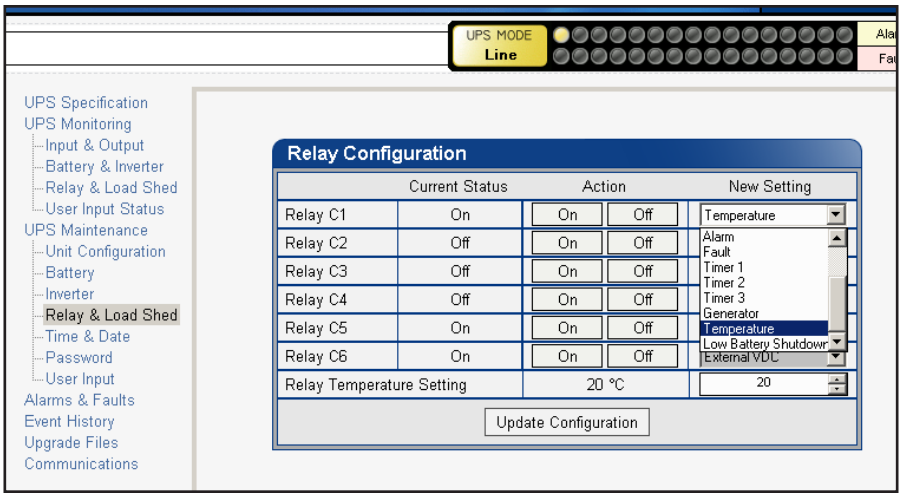
1. LCD panel – from the Logo screen, navigate to **Control Menu > RELAY TEMP**. Press the **SELECT** button and the current temperature display will start flashing. Use the **Scroll** button to change the temperature in 5°C increments. Press **SELECT** to accept the changes or **CANCEL** to abort.

RELAY TEMP	**120/60/N**
55	**LINE**

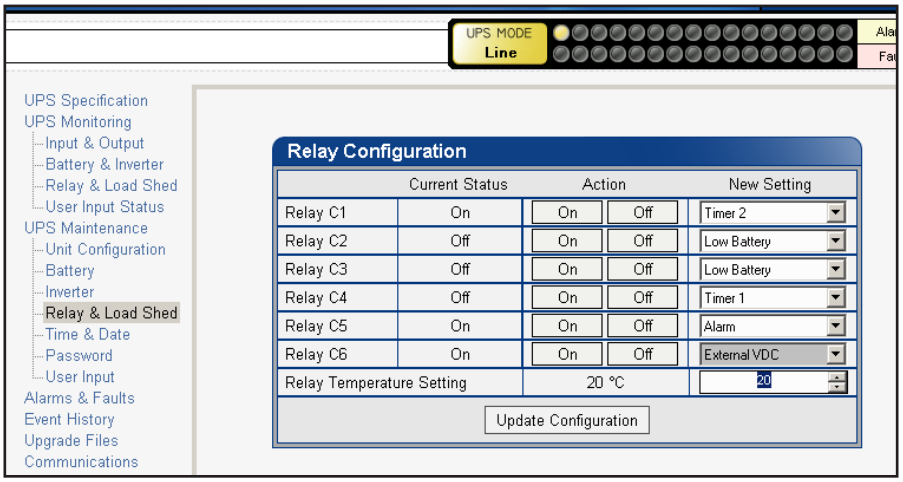
Note

Dry contact functions are not programmable through the LCD. Use the RS-232 GUI or the HyperTerminal instead.

2. RS-232 GUI – Figure 7.28(a) shows the **Relay Configuration** window under the **UPS Maintenance > Relay & Load Shed** screen. As an example, to assign C1 as the Temperature trigger, select **Temperature** from the drop down menu. Click **Update Configuration** and the current status will update momentarily. In the example shown in Figure 7.28(b) the temperature threshold is set at 55°C. To change this value to +20°C, simply type **20** into the **New Setting** box (or use the up/down arrow keys) and click **Update Configuration** to update the current status display.



(a) Assigning the Temperature trigger function to a dry contact



(b) Setting the Temperature trigger value

Figure 7.28 – Temperature trigger function via Novus User Software

3. RS-232 HyperTerminal – the Temperature trigger function can be assigned to any available dry contacts as described in "Programming the Dry Contacts" on page 51. (e.g. c1=11, where 11 is the assigned index for the Temperature trigger function.)
   After establishing an RS-232 connection with the FXM (see page 44), at the HyperTerminal screen prompt, type **temp** and press **Enter** to display the current temperature setting (FXM returns ***temp=20**). To change the value to +35°C, type **temp=35** and press **Enter.** (FXM returns ***temp=35** as confirmation.) See Figure 7.29.

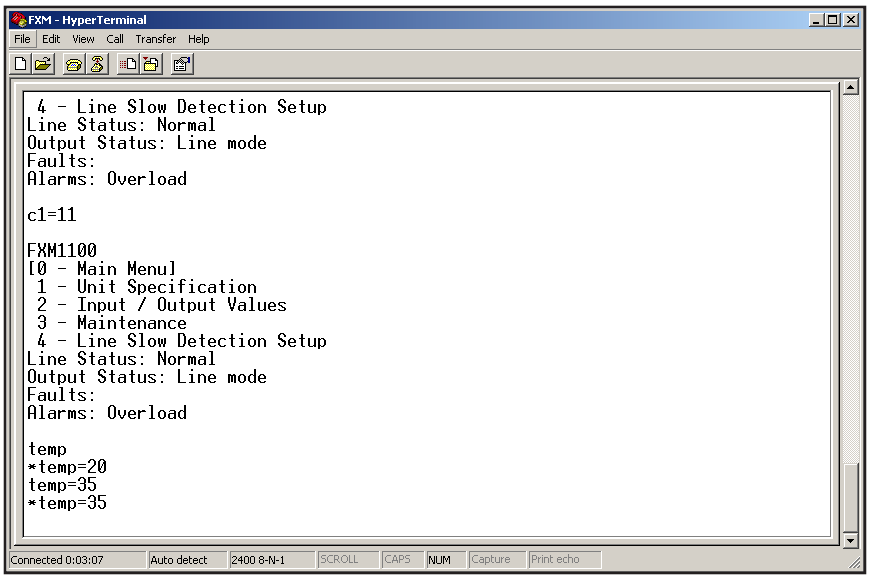


Figure 7.29 – Temperature trigger function via HyperTerminal

Restoring All Parameters to Default Values

The purpose of this command is to reset the FXM to a known state (factory default). See Table 7.1 for a list of parameters that will be restored to their default values.

Caution

This command resets all parameters which are user-configurable. All previously programmed operation will be lost. Make sure that you have a backup plan for mission critical operation. This command is password protected.

The default command can be issued via the RS-232 HyperTerminal or the RS-232 GUI as follows:

1. RS-232 HyperTerminal – type **default:all** and press **Enter**. (Enter the password and the FXM returns ***default** as confirmation.)

2. RS-232 GUI – Figure 7.30 shows the **UPS Maintenance > Unit Configuration** screen. Click the **Restore Defaults** button. Enter the password to execute the command.

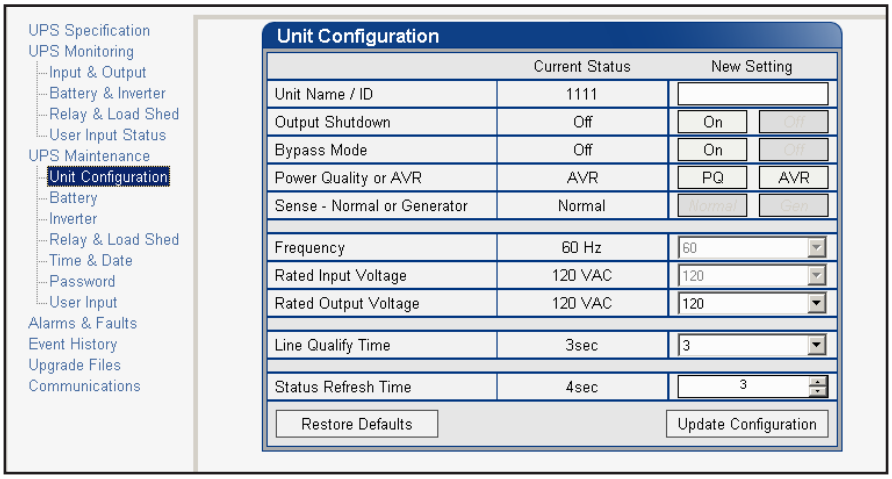


Figure 7.30 – Restore all default commnad

Description of Parameter
Maximum battery charging current
Temperature compensation of battery charging
Maximum allowable duration of output short circuit before shutdown
Property settings of programmable user input #1
Action #1 setting of programmable user input #1
Action #2 setting of programmable user input #1
Property settings of programmable user input #2
Action #1 setting of programmable user input #2
Action #2 setting of programmable user input #2
Property settings of programmable user input #3
Action #1 setting of programmable user input #3
Action #2 setting of programmable user input #3
Start hour of rush hour of time of day action period #1
Start minute of rush hour of time of day action period #1
End hour of rush hour of time of day action period #1
End minute of rush hour of time of day action period #1
Start hour of rush hour of time of day action period #2
Start minute of rush hour of time of day action period #2
End hour of rush hour of time of day action period #2
End minute of rush hour of time of day action period #2
Scheduled events
Format setting of date display on LCD
Line qualify time
Time setting of periodical self-test (minute) (hh:mm)
Inverter off delay setting
RS-232 baud rate

Number of weeks setting of periodical self-test
Day of the week setting of periodical self-test
Time of the day setting of periodical self-test
Battery low warning threshold setting (%)
Self test duration setting (minutes)
Internal temperature setting to turn on cooling fan
Load shed timer1 duration
Load shed timer2 duration
Load shed timer3 duration
Programmable dry contact #1 setting
Programmable dry contact #2 setting
Programmable dry contact #3 setting
Programmable dry contact #4 setting
Programmable dry contact #5 setting
Programmable dry contact #6 setting
Password setting

Table 7.1 – List of parameters reset to their default values by the restore default command

Programmable Dry Contact Time of Day Action

You can assign a dedicated timer to a dry contact. Upon entering the inverter mode of operation, the timer is activated and begins to count down from a user defined value. When the timer reaches zero, the programmed dry contact relay will be activated (Status = ON). See Figure 7.31.

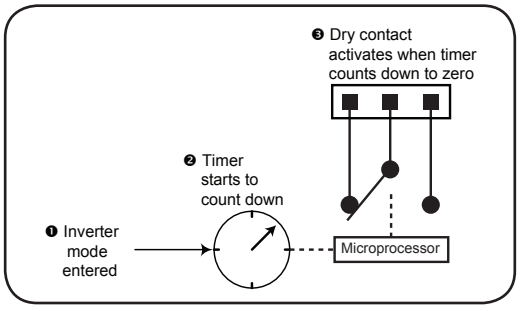

❸ Dry contact activates when timer counts down to zero
❷ Timer starts to count down
❶ Inverter mode entered
Microprocessor

Figure 7.31 – Programmable Timer Operation

A typical application of this timer controlled dry contact function would be in controlling a traffic light. When the grid power fails, the FXM goes into inverter mode and continue supplying backup power to the traffic light. Since the batteries supplying the backup power have limited capacities, a timer controlled dry contact is usually configured to switch the traffic light into the flashing amber mode after a user-defined period of time in an attempt to conserve battery power. This setup works fine during non peak hour traffic, but during peak hour, it is necessary to keep the traffic light running normally for as long as backup power is available. To address this issue, a new fea-

ture called the **Time of Day Action** is added to deactivate the timer during a user defined time period of the day. See Figure 7.32.

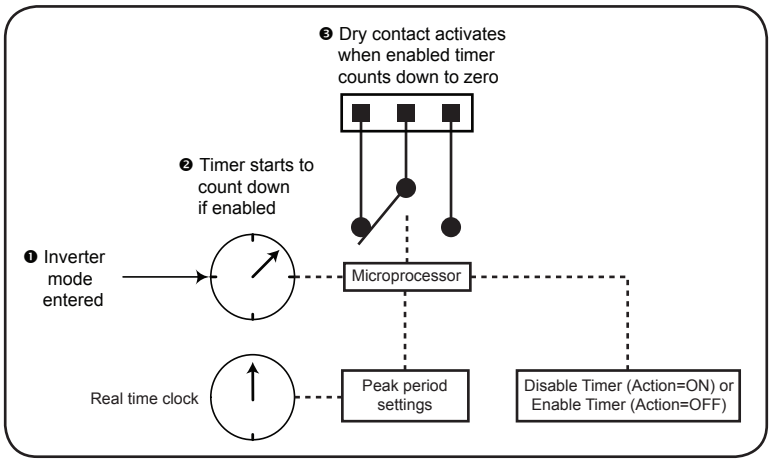

❸ Dry contact activates when enabled timer counts down to zero
❷ Timer starts to count down if enabled
❶ Inverter mode entered
Microprocessor
Real time clock
Peak period settings
Disable Timer (Action=ON) or Enable Timer (Action=OFF)

Figure 7.32 – Time Of Day Action Operation

You can define up to 2 peak time periods of the day:

1. Go to the **UPS Maintenance > Relay & Load Shed** screen (Figure 7.33).
2. In the **Time of Day Action Configuration** dialogue box, setup the start and end time of the first rush hour under **Time Period 1** and the second rush hour under **Time Period 2.** In this example, during the first time period (7 AM to 9 AM), all 3 timers are disabled (they do not count down at all). Similarly, all timers are disabled during the second time period (3 PM to 6 PM).
3. Select **ON** under each time period. Click the **Update** button under each time period to store the settings. Confirm your settings in the **UPS Monitoring > Relay & Load Shed > Time of Day Action Status** screen. (Figure 7.34).

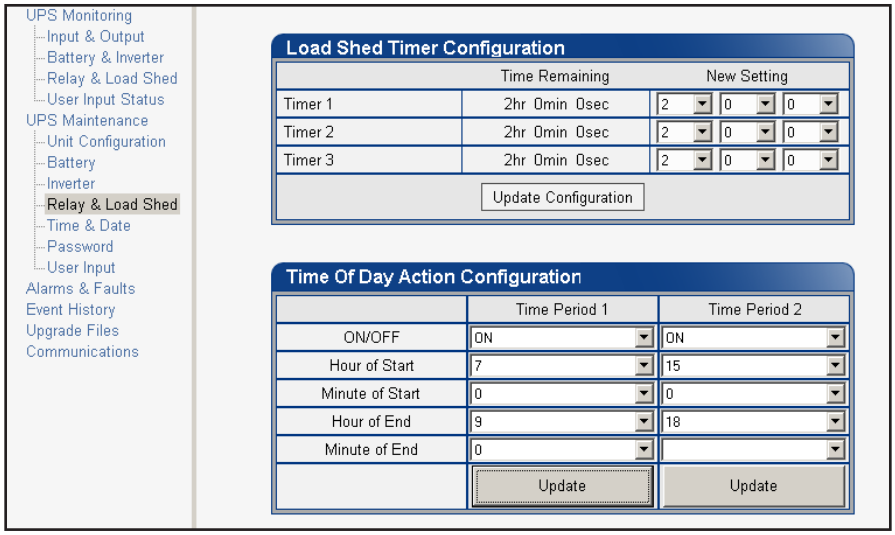


Figure 7.33 – Time Of Day Configuration

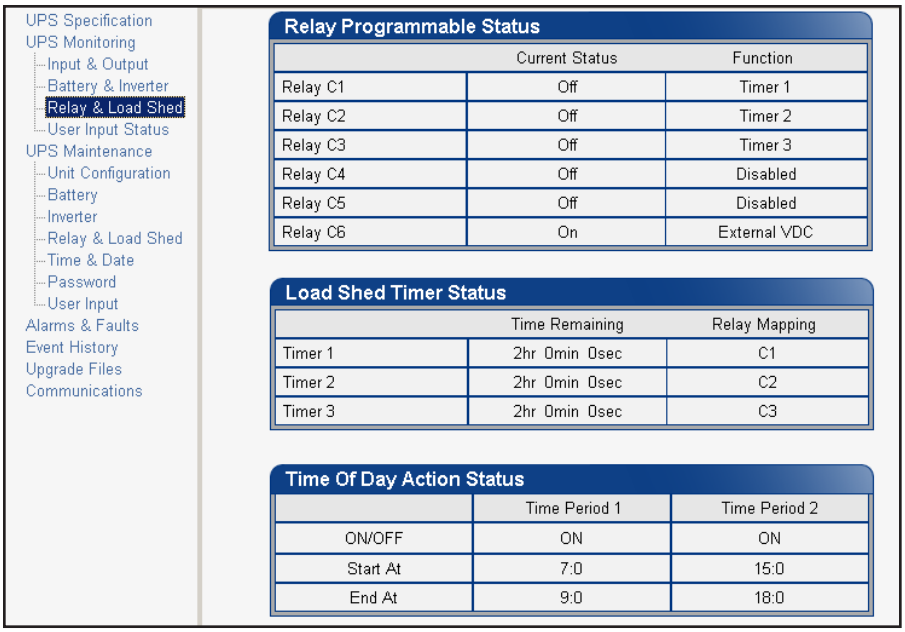


Figure 7.34 – Time Of Day Action Status

Once the Time of Day Action is configured, the FXM will automatically disable the timers during inverter mode at the defined peak periods.

You can also turn off the Time of Day Action by setting one (or both) Time Period(s) to **OFF** (Figure 7.33). In this case, the dry contact will be activated by the timer regardless of the peak period settings.

Time & Date: This lets you set the FXM's date and time.

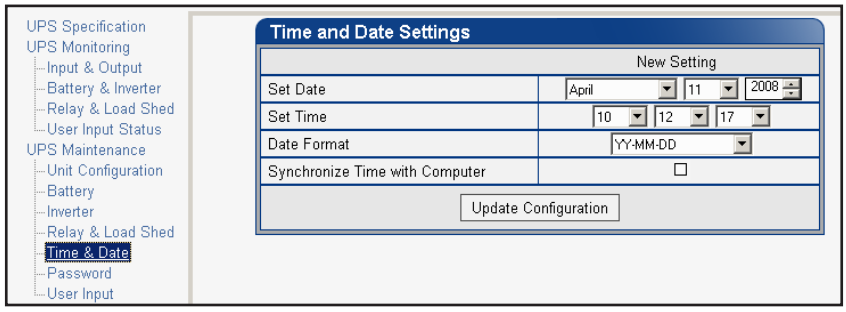


Figure 7.35 – UPS Maintenance: Time & Date screen

Password: This lets you set the FXM's password. The factory set password is 1111.

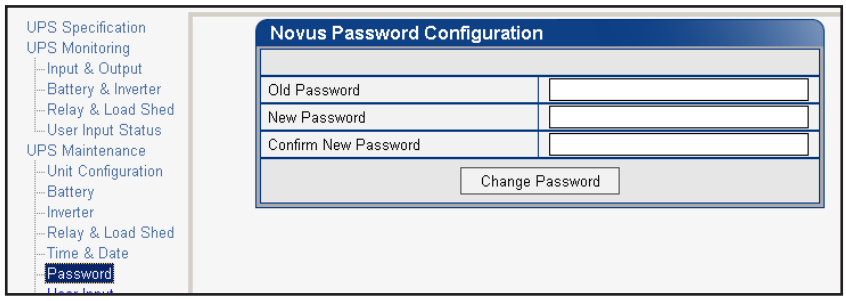


Figure 7.36 – UPS Maintenance: Password screen

Note

The password is limited to 4 alphanumeric characters. The software will not allow you to type in more than 4 characters.

User Input: There are 3 programmable User Inputs and their functions are similar to the Dry Contact relays. Supported functions include (a) Shutdown, (b) User Alarm and (c) Self Test. (Figure 7.37)

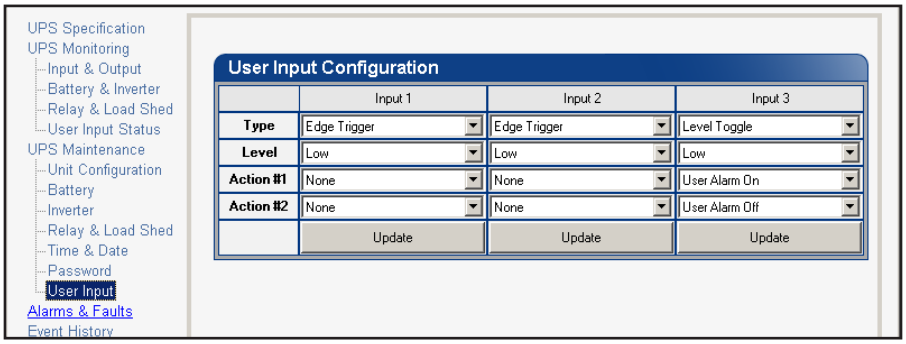


Figure 7.37 – UPS Maintenance: User Input screen

You can configure any User Input to perform a certain action in response to different trigger types and logic levels. For example, if you want the FXM to issue an intrusion alarm when the door is opened, you will need to wire the door with a switch that triggers a User Input every time the door is opened. The following procedure describes how you would configure User Input 1 to function as the intrusion alarm input.

Procedure

1. Click on **UPS Maintenance** > **User Input** to display the **User Input Configuration** window. (Figure 7.38)

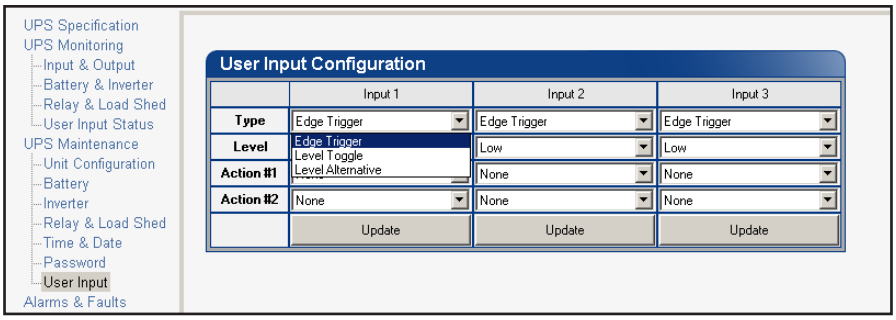


Figure 7.38 – User Input Configuration: Setting the Trigger Type

2. In the Input 1 column, click on the **Type** down arrow to display the 3 types of available triggers (Edge Trigger, Level Toggle and Level Alternative). For more information on how triggers work, see "Types of Trigger" on page 73.
3. Select **Edge Trigger**.
4. Select **Low** from the **Level** drop down menu. The User Input will go to logic level "low" whenever it is triggerred. (Figure 7.39)

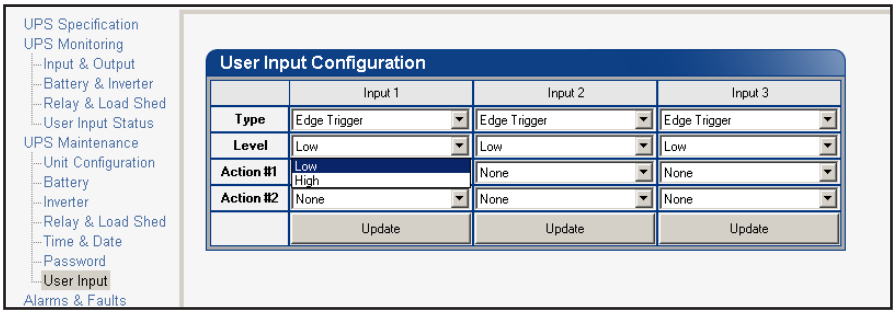


Figure 7.39 – User Input Configuration: Setting the Logic Level

5. Select **User Alarm On** from the **Action #1** drop down menu. (Figure 7.40)

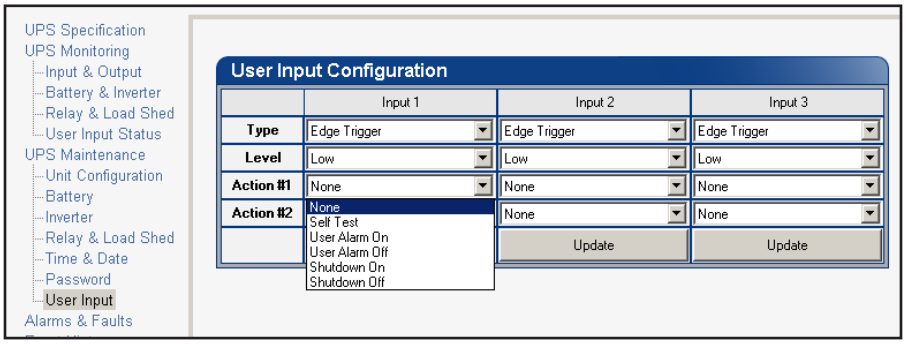


Figure 7.40 – User Input Configuration: Setting an Action

6. Click the **Update** button and enter the password to confirm if required.
7. Check the **User Input Current Status** at the **UPS Monitoring > User Input Status** page. (Figure 7.41)

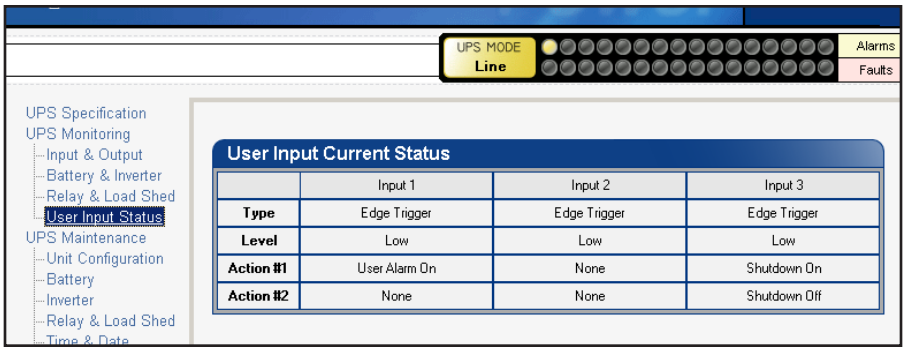


Figure 7.41 – User Input Current Status

You can perform a quick test by shorting the User Input 1 dry contact pin (pin 19 of C6) to ground (pin 22 of C6) with a short length of PVC insulated electronic hook-up wire. This will trigger the FXM to issue a User Input Alarm as shown in Figure 7.42.

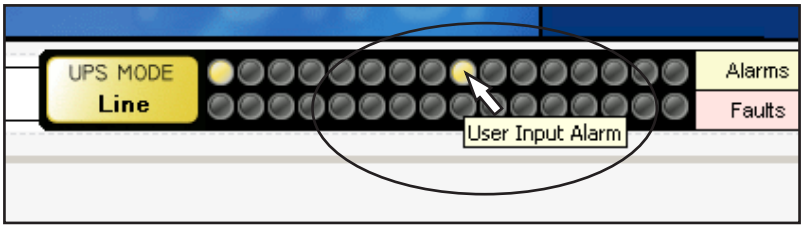


Figure 7.42 – User Input Current Status

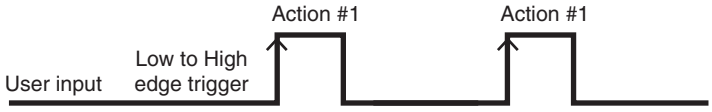
Note

Hovering the cursor over the amber indicator in Figure 7.42 will display the corresponding context sensitive message.

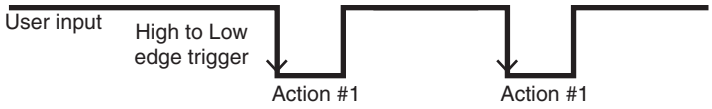
Types of Trigger

There are 3 types of trigger:

- Edge trigger – when the user input changes from one state to the other, the FXM is triggered to perform Action #1 (see Figure 7.43). If Level is set to High, the action will be triggered by a Low to High edge (leading edge). If Level is set to Low, the action will be triggered by the High to Low edge (falling edge).



(a) Level = High
User Input = Low to High, Action #1 is triggered
User Input = High to Low, no action triggered



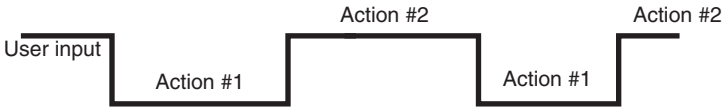
(b) Level = Low
User Input = High to Low, Action #1 is triggered
User Input = Low to High, no action triggered

Figure 7.43 – Edge Trigger

- Level Toggle – when Level is set to High, the FXM is triggered to perform the other action when the user input changes from Low to High (see Figure 7.44a). If the input then changes from High to Low, Action #2 will be triggered. In other words, a level change in the user input will trigger an action toggle between Action #1 and #2.

(a) Level = High

User Input = Low to High, Action #1 is triggered
User Input = High to Low, Action #2 is triggered

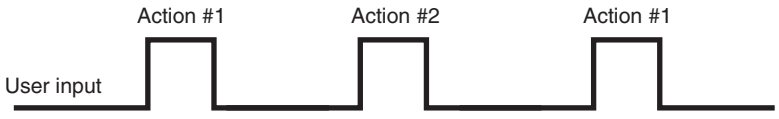


(b) Level = Low

User Input = High to Low, Action #1 is triggered
User Input = Low to High, Action #2 is triggered

Figure 7.44 – Level Trigger

- Level Alternative – when Level is set to High, the FXM is triggered to perform the next action when the user input changes from Low to High (Figure 7.45a). If the input then changes from High to Low, no action will be triggered because Level is set to High. In other words, only a Low to High user input level triggers an action when Level is set to High Similarly, when Level is set to Low, the FXM will trigger an action only with a High to Low user input (Figure 7.45b).



(a) Level = High

User Input = Low to High, Action #1 is triggered
User Input = High to Low, no action triggered
User Input = Low to High, Action #2 is triggered
User Input = High to Low, no action triggered

(b) Level = Low

User Input = High to Low, Action #1 is triggered
User Input = Low to High, no action triggered
User Input = High to Low, Action #2 is triggered
User Input = Low to High, no action triggered

Figure 7.45 – Level Alternative

■ ALARMS & FAULTS

This read-only screen shows you the operating status of the FXM (see also “Troubleshooting” on page 87). When the fault or alarm indicators on the horizontal bar are lit, place your mouse cursor over the light to display the context sensitive message.

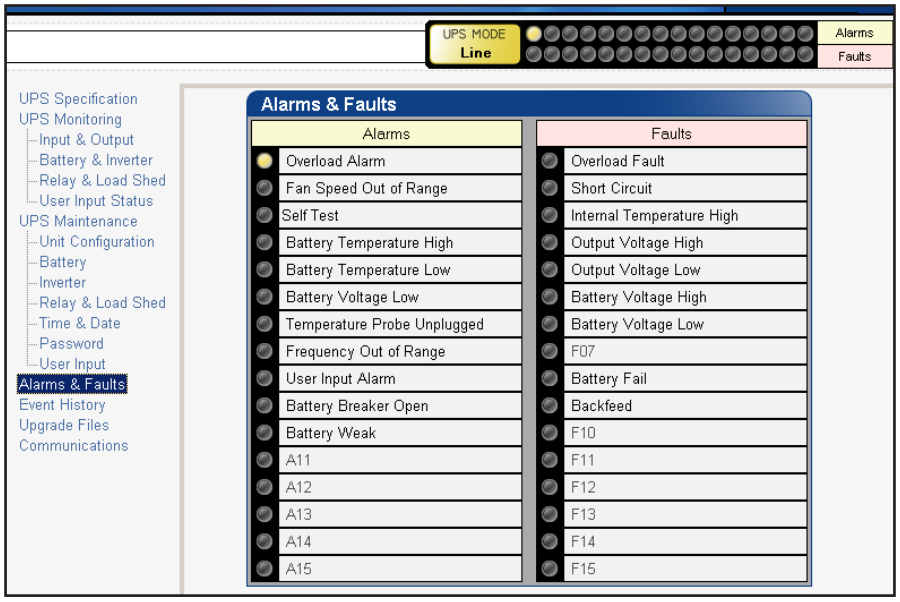


Figure 7.46 – Novus User Software: UPS Alarms & Faults screen

■ EVENT HISTORY

This screen shows you the last 100 events recorded by the FXM. Choosing a number in the **Event Index** drop-down box and then clicking on the **View Selected** button will display the updated information about the selected event.

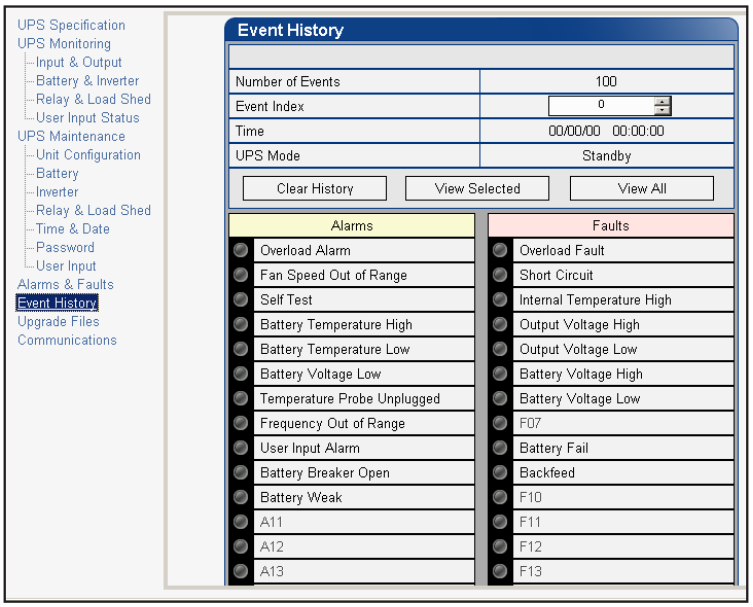


Figure 7.47 – Novus User Software: UPS Event History screen

To view all the events, click on the **View All** button to open the **Event Log Monitor** window (Figure 7.48). Clicking on the **Clear History** button clears the log. This action cannot be undone.

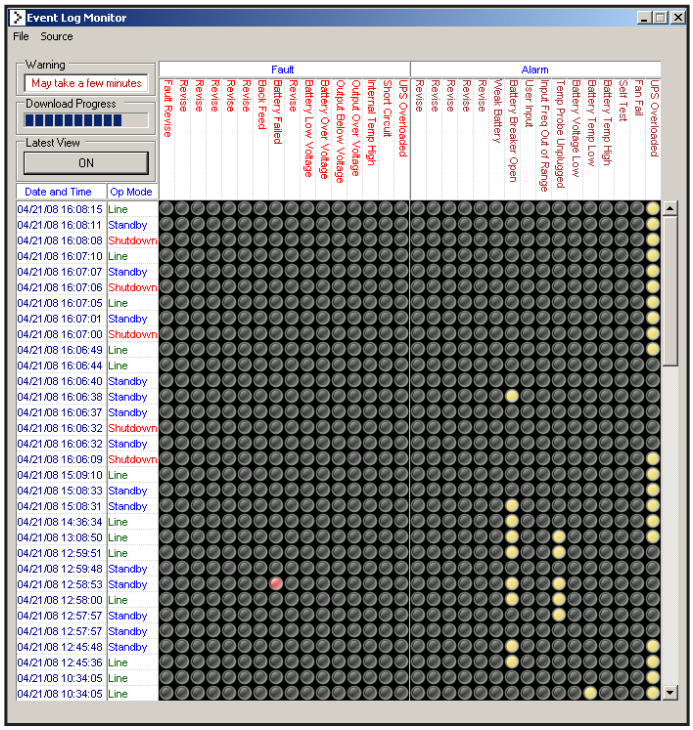


Figure 7.48 – Novus User Software: Event Log Monitor screen

In the **Event Log Monitor** window, the events are displayed by date and time and you can scroll up and down the list to select the events you want to see. To download the latest events, select **Source > Com**. In the **Open Event File** window, select the default event file *"event-1111.txt"* (where 1111 is the serial number of the FXM) from the default directory (Novus User Software V2.00.03). This will load the previously saved events for viewing. Once the event file is loaded, the software automatically begins to download the stored events from the FXM to the computer. This process may taken a few minutes, and *"event-1111.txt"* will be overwritten.

Note

To build a complete history of events for a FXM, it is a good practice to save all the downloaded events from the unit to the same event file. Alpha recommends keeping the default filename (*event-1111.txt*) in the default directory (Novus User Software V2.00.03). A maximum of 999 events can be stored on the FXM. The oldest events are replaced by the newest ones.

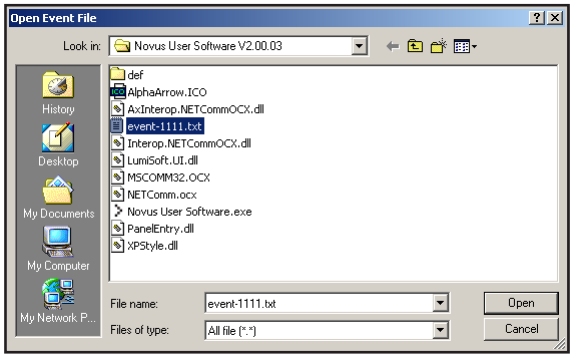


Figure 7.49 – Event Log Monitor, Open Event File window

If you choose to save the event log under a different filename and in a different directory, you can do so using the **File > Save As** command as shown in Figure 7.50.

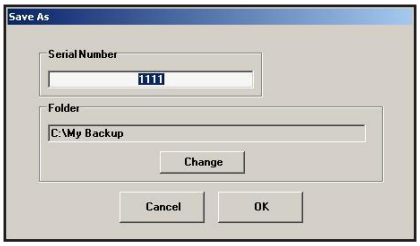


Figure 7.50 – Saving the event log under a user-defined filename and directory

If you just want to view a previously saved event log without downloading any new events from the FXM and overwriting the saved event file, select **Source > File** and navigate to the saved event log file.

■ UPGRADE FILES

This screen shows the current version number of the Novus firmware.

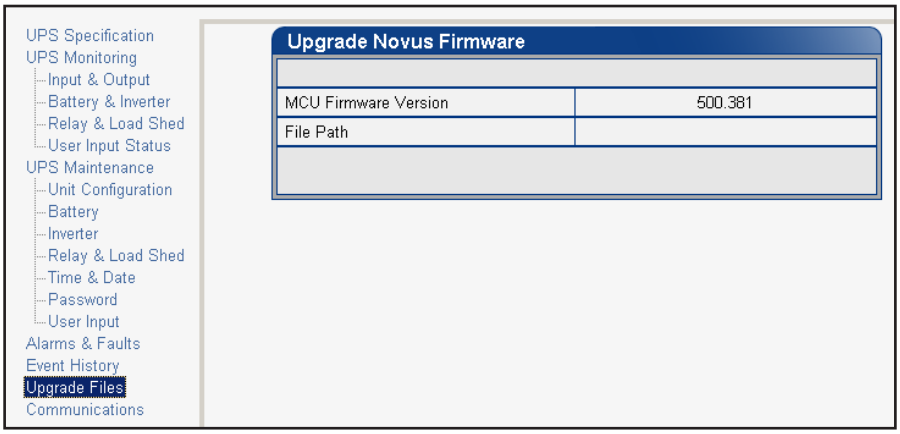


Figure 7.51 – Novus User Software: UPS Upgrade Files screen

■ COMMUNICATIONS

This screen changes the FXM's communication parameters. You cannot change the RS-232 Baud Rate.

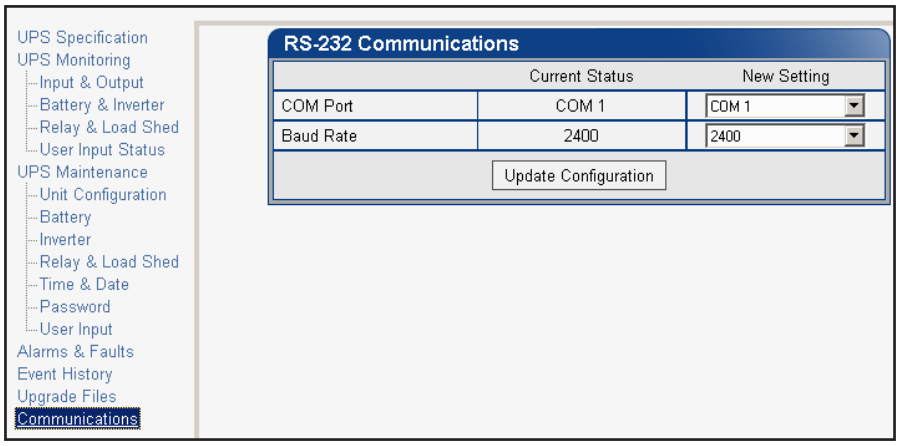


Figure 7.52 – Novus User Software: UPS Communications screen

8. Maintenance

Updating the Software

The Novus FXM's firmware can be reinstalled or updated to the latest version with this procedure.

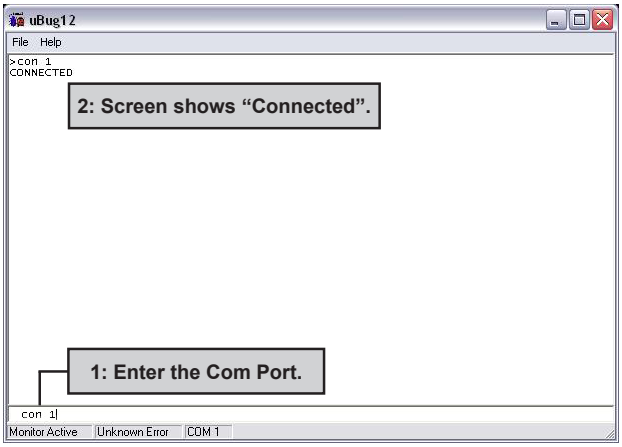
You will need the following items:

- RS-232 connection cable to the FXM (See page 45)
- **uBug12** software installed on your computer (available for download from Alpha's web site (www.alpha.com).
- Alpha's firmware installed where you can access it with your computer (available at www.alpha.com).

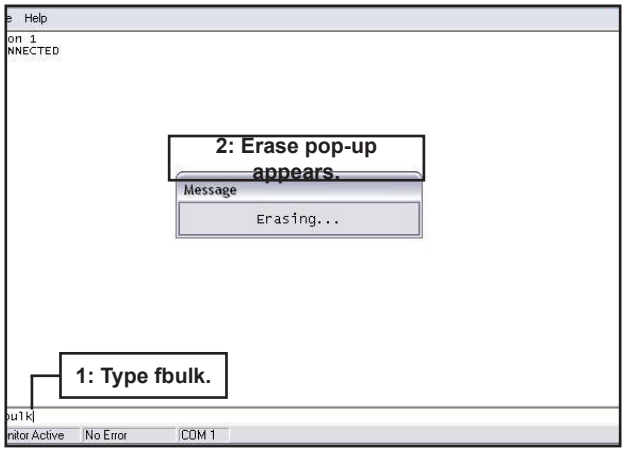
Procedure

1. Turn off the FXM (See page 37)
2. Connect the RS-232 cable (if it is not already connected).
3. While pressing and holding the **SELECT** button, turn on the battery circuit breaker. The LCD panel shows "**Alpha XP ISP**".

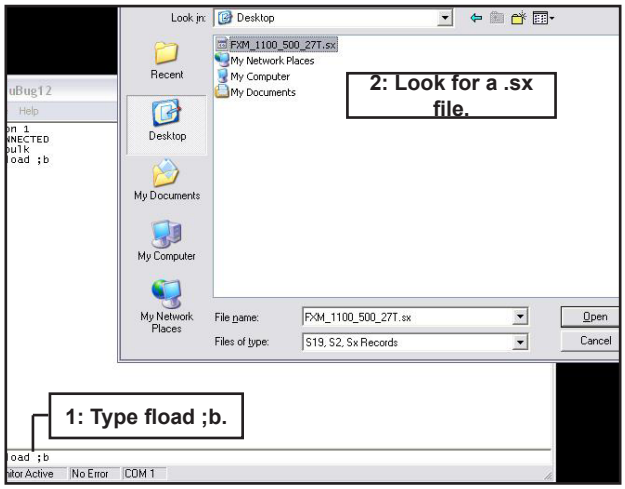
4. Start **uBug12**.
5. Type (all lower case) **con**(1 space)**1**(or the number of the computer's comm port you are using) and press **ENTER**. The screen shows "connected" when the connection is established.



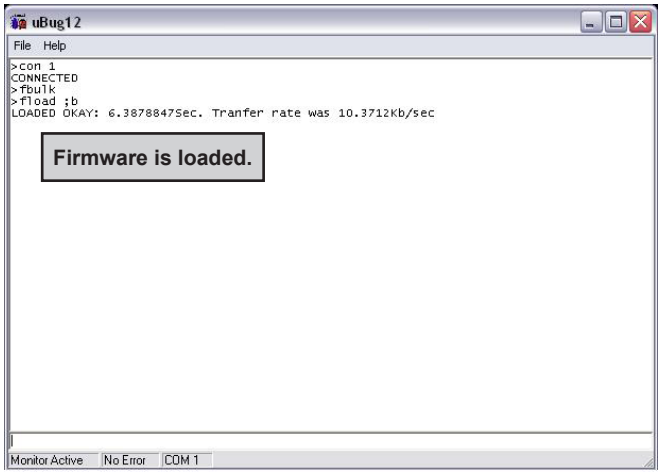
6. In the **uBug12** screen, type (all lower case) **fbulk** and press **ENTER**. The erase pop-up appears. It disappears when the FXM's memory is erased. If an error message appears, send the **fbulk** command again.



7. In the **uBug12** screen, type (all lower case) **fload**(1 space);**b** and press **ENTER**. A pop-up appears asking you to locate the new firmware. Look for a "**sx record**" (***.sx**). Select this new firmware. The **fload** pop-up appears.



When the software has finished loading into the FXM, the pop-up shows "**Loaded OK in (xx) seconds.**" If an error message appears, turn off the FXM and start over again.



Note:

It should not take more than one or two restarts to load the software. If problem persists, contact Alpha Technical Support.

8. Type (all lower case) **exit** and press **ENTER**. The **uBug12** screen disappears.
9. Turn the battery breaker off.
10. To check if the installation was successful, turn the battery breaker back on and the LCD's logo screen should appear as follows. If it shows "**Alpha XP ISP**" as shown in step 3 earlier. Try installing the firmware again.

Alpha	**120/60/N**
FXM	**LINE**

Testing and Replacing the Batteries

Battery life

Batteries lose their ability to store power throughout their life. The batteries should be regularly tested to ensure they can continue to provide reliable service. Battery life is reduced by three major factors:

a. Temperature – higher ambient temperatures, especially above 25°C, will reduce battery life. For example, an average operating temperature of 27°C will likely reduce the life of the battery by 25%. Ensure that the FXM and batteries are situated in a well ventilated area with adequate temperature control. A cooler environment is preferable.

b. Number of discharge cycles – the more frequent the batteries are discharged, the shorter the battery life. Frequent power outages imply the need for more frequent battery replacement.

c. Depth of discharge – the longer the batteries are required to provide back up power, the shorter the battery life. Frequent full discharging (and the associated recharging) of the batteries reduces their life. Shut down the electrical load or return to primary power as soon as possible in order to extend battery life.

Battery Run Time

Figure 8.1 shows a chart of typical run times (time to full discharge) for the standard batteries supplied with this unit. Note that these runtimes are for batteries in new and good conditions and that run time performance will deteriorate over time in a progressively decreasing curve.

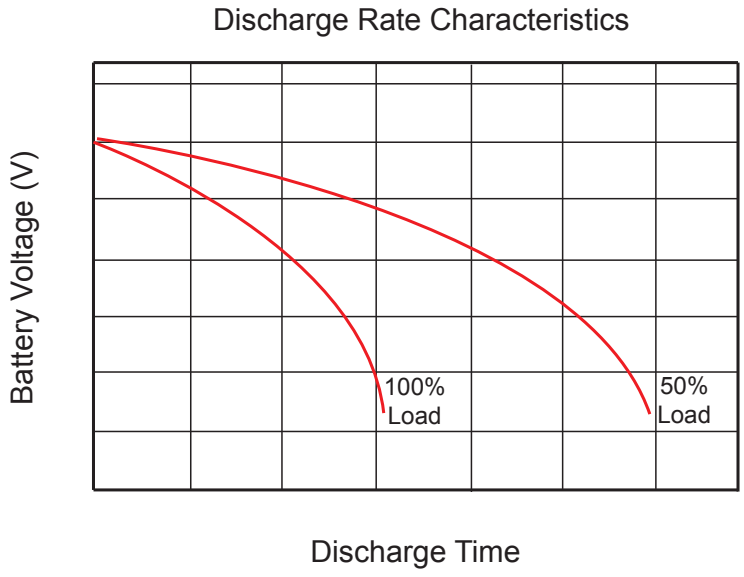


Figure 8.1 – Typical Discharge Characteristics for Lead Acid Batteries

Battery Maintenance

The batteries supplied with this unit are sealed and maintenance free. Regularly ensure that all connectors are tight and free of corrosion. The presence of corrosion, swelling of the battery case or distortion in the shape of the case suggests that the batteries need to be replaced (see “Replacing the Batteries” below).

Battery Conductance Test (Optional)

1. Place the conductance meter probes across battery #1.
2. Record the voltage and Siemens values in your log book.
3. Repeat for batteries #2, #3 and #4.

A new AlphaCell 180GXL battery has a conductance reference value of 1100 Siemens at 25°C. When this value drops to 550 Siemens or 50% of the new battery reference value, the battery can be considered suspect of being below 80% capacity and should be evaluated further. When the temperature of the batteries is not between 20°C. and 30° C, use the following temperature compensation values.

Battery Temperature	Reference Value New 180GXL	Suspect Value
35°C or higher	1183	592
30°C	1140	570
25°C	1100	550
20°C	1063	532
15°C	1028	514
10°C	995	498
5°C	965	483
0°C or colder	936	468

Replacing the Batteries

Replace batteries as indicated by the results of self testing or the presence of terminal corrosion, swelling of the battery case or distortion in the shape of the case. New batteries will normally provide longer run times than older ones. Larger capacity batteries may be available. Please call Alpha Technical Support (1-800-667-8743) to order replacement batteries or to obtain assistance. On-site service may be available in your area.

Tools and Materials Required

- AC/DC voltmeter or multimeter
- Labels or masking tape and marker
- Torque wrench
- Slot head screwdriver to fit the terminal blocks
- High strength, flame-proof tape (such as duct tape)

- Battery terminal corrosion inhibitor (such as NOCO Company's NCP-2 or Sanchem Inc.'s No-Ox ID Grease "A")

WARNING

Make sure you have read and understood the battery safety instructions in "Product Safety Information" on page 5.

Caution

Make sure all the replacement batteries are of the same type and rating. Failure to do so could result in improper charging and damage the batteries.

Note

While the batteries are being replaced, the FXM cannot provide backup battery power. If the line becomes unqualified while the batteries are being replaced, the FXM shuts down and no power is provided to the load.

Procedure

1. The FXM must be in Line State (See Figure 7.2). If it isn't, wait until the line is qualified before proceeding.
2. Switch the FXM into Bypass State by doing one of the following:
   a. From the FXM control panel, navigate to the **UPS Control Menu > INV BYPASS** (See Figure 7.2); press the **SELECT** button once, OFF is flashing; press the **SCROLL** button once, ON is flashing; press **SELECT** button once, ON is now displayed continuosly, indicating that the the FXM has been switched into the bypass state.
   b. From the Novus User Software main screen (page 59), go to the **UPS Maintenance > Unit Configuration** screen. Turn **Bypass Mode** on by clicking the **ON** button and then the **Update Configuration** button. The FXM responses by displaying a "Bypass State" alarm. This is normal and does not indicate a problem. It will clear itself when the Bypass State is subsequently disabled.
3. Turn off the battery circuit breaker.
4. Replace the batteries (Also see "Wiring the external batteries" on page 28).
5. Turn on the battery circuit breaker
6. Switch the FXM out of Bypass State by turning **Bypass Mode** OFF.

Preventative Maintenance

Preventative maintenance should be performed on the FXM module every 6 to 12 months. For mission critical applications such as backup traffic intersections, more frequent maintenance should be planned. Proper implementation of the following procedure will insure that your system continues to provide reliable backup power in the event of a utility power failure.

Tools and Materials Required

- Wrench set
- Labels and marker to number batteries
- Conductance meter (for optional conductance test)

Procedure

1. Inspect the FXM and wiring for any physical damage. Repair or replace as required.
2. Verify that all connections are securely fastened. Tighten if necessary.
3. Inspect the batteries for cracks or swelling. Replace all 4 batteries if any of the batteries are cracked or swollen. Replace only faulty battery if an Alphaguard battery balancer is installed.
4. Inspect the battery terminals for corrosions. Clean and apply a corrosion prevention compound such as NOCO Company NCP-2 or Sanchem Inc. NO-OX-ID if required.
5. Re-tighten the battery terminal bolts on Insert Terminal batteries or re-torque to the manufacturers specifications the battery terminal bolts on Flag Terminal batteries if required.
6. Label the batteries #1, #2, #3 and #4. The battery negative cable from the FXM is connected to battery number one and the battery positive cable from the FXM is connected to battery number four.
7. Verify that the battery temperature probe is securely taped to the side of either battery #2 or #3.

Operational Test

1. Activate the FXM self-test function.
2. After passing the self-test, disconnect the AC input to the FXM to trigger the FXM into the backup (inverter) mode.
3. Let the FXM operate in the backup mode for approximately 10 minutes.
4. Measure the individual battery voltages while the FXM is operating in the backup mode. There should be no more than 0.6 volts difference between the highest battery voltage and the lowest battery voltage.

Caution

One battery measuring 2 volts lower than the other 3 batteries in the string indicates a shorted cell in that battery. Replace all 4 batteries. Three batteries in the string measuring the same voltage and one battery measuring several volts higher indicates an open cell in the battery with the higher reading. Replace all 4 batteries.

5. Verify that there is no Low Battery Alarm.
6. Reconnect the AC input.

Service and Technical Support

Alpha Technologies is committed to the support of Alpha products throughout their life. Alpha provides a full range of service products including extended warranties, on-site service plans and battery renewal programs. Parts, supplies and replacement or upgraded battery packs are also available. To discuss any of your after-sales needs, please call 1-800-667-8743 and ask for Service.

9. Troubleshooting

When the front panel alarm LED is on or flashing, the FXM has a malfunction. The alarm and fault submenus (Figures 9.1 and 9.2) describe the malfunction. You can also use the Novus User Software for troubleshooting (*See* "Novus User Software" on page 56).

Procedure

1. Press the **SELECT** button.
2. One of the conditions listed in Figure 9.1 and 9.2 is displayed on the LCD.
3. Press the **SCROLL** button to see if more than one malfunction is present.
4. To clear the malfunction from the screen, press and hold the **SELECT** button for 5 seconds.

Alarm Submenu

LCD Shows	Description of Problem	What To Do
Over Load	The FXM is overloaded.	Remove excess loads.
Batt Temp High	The battery temperature is above the specifications.	Ensure that the battery fan (if used) is working. Contact Alpha Technical Support to purchase an upgrade if required.
Batt Temp Low	The battery temperature is below the specifications.	Use optional battery heating mats or heater. Contact Alpha Technical Support to place the order.
Batt Low Warning	The batteries are almost discharged. Also see "Adjusting and Controlling the Novus FXM, #35: Low Battery Warning Voltage." on page 50.	Ensure that the FXM charger is working; if the charging voltage is low, the battery may need to be replaced.
FAN Alarm	The fan has failed.	Contact Alpha Technical Support.
Temp Probe Unplug	The temperature probe is unplugged.	Plug it back into the FXM or change the probe.
User Input Alarm	When the user input is shorted (*See* "User Input: S2" on page 17), this alarm appears.	Check user input parameters.
In Freq Out Of Range	The line frequency is outside of the FXM's qualified range. FXM goes to inverter mode.	Info only.
Weak Battery	The battery is being monitored continuously in the background in Line mode. This alarm is issued if the battery did not pass the background scan.	Check the battery life and replace the battery if necessary.
Self Test	The FXM is performing self test.	Info only.
Batt Breaker Open	The battery breaker is opened.	Ensure the battery breaker is functioning.

Figure 9.1 – Alarm Submenu

Fault Submenu		
LCD Shows	**Description of Problem**	**What To Do**
Overload Fault	The load draws more power than the FXM can provide. This can lead to an automatic FXM shutdown. .	Remove excess loads
Short Circuit	The load has a short.	Check the output. Remove the faulty load if necessary.
Intl Temp Fault	The FXM's internal temperature is too high and could cause an automatic FXM shutdown.	Verify that the fan is not blocked and that it is working by performing a self test. ***Also See*** Fan Fail Alarm.
Output Over Voltage	The output voltage is above or below the FXM's specifications.	Info only.
Output Voltage Low		
Battery Fail	In Inverter mode, the battery voltage has dropped below a specified level. This fault is triggered and the inverter shuts down. Note: This fault is also known as a Low Battery Shutdown or Bad Battery.	Info only. The FXM will recharge the battery when the FXM requalifies the line.
Backfeed	A relay inside the FXM has failed. It cannot be fixed in the field.	**DANGER:** Do NOT touch the AC input terminals. Contact Alpha Technical Support.
Battery Over Voltage	Battery voltage is abnormally high.	Check the voltage at the battery voltage test points (see page 15). Ensure the battery is in good working condition. Replace the battery if necessary.
Batt Volt Low	Battery voltage is low and is close to self-kill level.	Ensure that the FXM charger is working; if the charging voltage is low, the battery may need to be replaced.

Figure 9.2 – Fault Submenu

The following table contains a list of possible problems you may encounter which are not reported by the system.

Other Problems		
Problem	**Possible Cause**	**What To Do**
No LCD display even when the FXM is powered on	The LCD may not function below -15°C. This does not affect the normal operation of the FXM.	Bring the operating temperature above -15°C and the LCD display will gradually resume operation.
Date and time reset to 00:01:00 and 00:00:00	The backup lithium coin battery may need to be replaced. This is possible if the FXM has been in storage or turned off for a prolonged period of time. The average operating life of the lithium coin battery is about 5 years.	Replace the lithium coin battery. **Caution**: This must be performed by a qualified service personnel. Dispose of used batteries according to your local laws and jurisdictions.

Appendix A: Specifications

Due to ongoing product improvements, specifications are subject to change without notice.

Mechanical Specifications	
Dimensions, in (mm) **H x W x D**	1100-2000: 5.22 x 15.5 x 8.75 (133 x 394 x 222) 650: 3.47 x 17 x 9 (89 x 432 x 229)
Weight, lb (kg) **without batteries**	650: 25 (11.3) 1100-2000: 35 (15.9)
Color	Black
Mounting	Shelf, rack or wall; horizontal or vertical mount.
Humidity	Operating (non-condensing): Up to 95% Storage: Up to 95%
Temperature Range[1, 2]**, °C** **FXM 650/1100:** **FXM 2000:**	 Operating: -40 to 55 Storage: -40 to 75 Operating: -40 to 50 [3] (120VAC Unit); -40 to 55 (230VAC Unit) Storage: -40 to 75
Altitude, ft (m) **Operating** **Storage**	 Up to 12,000 [4] (3658) Up to 15,000 (4572)
AC Input and Output Connectors	Terminal block, Weco p/n 324-HDS/03 or equivalent (max 10 AWG)
Dry Contact Connectors	Terminal block, mating plug JITE p/n PTB750B-03-1-03-3 or equivalent (max 16 AWG)
RS-232 Connector	DE-9 Female
Ethernet Connector	Optional, factory installed RJ-45
Dry Contacts	6 sets of single-pole, double-throw relays located on the front panel. They are rated at 250VAC, 1A. The factory default settings are: C1: On Battery C2, C3 [5]: Low Battery C4: Load Shed Timer1 C5: Alarm C6: 48/24VDC for an external fan. It can be factory configured as a dry contact.
User Inputs	Three optically-isolated and powered inputs are located on the front panel. When they are shorted, their functions are: S1: Starts the self test. S2: Activates an alarm. S3: Unit shutdown.
User Interface [6]	2 x 20 backlit alpha-numeric LCD screen. Three control buttons located below.

Notes:
1. Capable of operating at 73% of rated full load for up to 2 hours at 74°C. Above 55°C ambient, derate output power by 1.4% per °C rise, up to 74°C max.
2. Capable of operating at 100% of rated full load below 0°C down to -40°C after the FXM has been stabilized at 0°C for at least 1 hour.
3. FXM2000-120V only: above 50°C ambient, derate output power by 1.1% per °C rise, up to 74°C max.
4. Derate 2°C per 1000 ft (305 m) above 4500 ft (1372 m).
5. For FXM650/1100-48(Q), the default setting of C3 is “FAULT”.
6. The LCD display may not function below -15°C. It gradually resumes normal operation as the temperature rises above -15°C. This will not affect the operation of the FXM.

Due to ongoing product improvements, specifications are subject to change without notice.

Electrical Specifications	
Input	
Voltage (nominal), VAC	120 or 230 (optional 220), 120 only for 650-48
Frequency, Hz, ±5%	60/50 (auto-detection) (note: Output frequency = Input frequency)
Current, Amps (@ nominal Vin and max battery charging current)	650-24: 8.7/4.5 @120/230VAC 650-48: 10.5 @120VAC 1100: 15.5/8 @120/230VAC 2000: 20/12 @120/230VAC
Input Circuit Breaker Ratings, Amps	650-24: 15/10 @120/230VAC 650-48: 15 @120VAC 1100: 20/10 @120/230VAC 2000: 25/15 @120/230VAC
Battery Circuit Breaker Ratings, Amps	650-48/1100: 50 650-24/2000: 80
Output	
Voltage (nominal), VAC	120 or 230 (optional 220), 120 only for 650-48
Frequency, Hz, ±5%	60/50 (note: Output frequency = Input frequency)
Power, W/VA	650: 650 1100: 1100 2000: 2000
Waveform	Pure Sine Wave
Load Crest Factor	3:1 (load dependent)
Output Voltage Distortion	< 3% THD (resistive load)
Efficiency [7] **Normal Mode** **Backup (Inverter) Mode**	 >98% >82% (48 Vbatt) >75% (24 Vbatt)
Transfer Time, mS **AVR to Backup** **Backup to AVR**	 5 (Typical) 5 (Typical)
Line Qualification Time, Seconds	3 (factory default), user adjustable to 3, 10, 20, 30, 40, or 50. (See page 41)
Battery String Voltage	650-24: 24 VDC 650-48/1100/2000: 48 VDC
Battery Charger Current, Amps	10 (factory default), user adjustable to 3, 6 or 10. (See page 41)
Battery Charger Temperature Compensation [8]	-5mV/°C/Cell (factory default), user adjustable to -2.5, -4, -5 or -6mV/°C/Cell.
Battery type	Anderson Power mating part SB50 or equivalent

Notes:
7. Efficiency is measured at an ambient temperature of 25°C. full resistive condition and nominal Line and Battery voltage.
8. With external battery temperature probe assembly. For FXM650-48(Q), charger compensation is disabled.

Due to ongoing product improvements, specifications are subject to change without notice.

Boost/Buck/Line Transfer Thresholds

Parameter	FXM 650 / 1100		FXM 2000
	120 VAC Units	230 VAC Units	120 VAC Units
High Line Transfer **High Line Retransfer**	175 VAC 162 VAC	325 VAC 303 VAC	152 VAC 146 VAC
Buck 2 Transfer **Buck 2 Retransfer**	152 VAC 146 VAC	282 VAC 272 VAC	Not Available
Buck 1 Transfer **Buck 1 Retransfer**	134 VAC 128 VAC	250 VAC 236 VAC	134 VAC 128 VAC
Boost 1 Retransfer **Boost 1 Transfer**	116 VAC 112 VAC	210 VAC 207 VAC	116 VAC 112 VAC
Boost 2 Retransfer **Boost 2 Transfer**	102 VAC 98 VAC	180 VAC 176 VAC	102 VAC 98 VAC
Low Line Retransfer **Low Line Transfer**	97 VAC 88 VAC	162 VAC 151 VAC	97 VAC 88 VAC

Regulatory

Electrical Safety	UL 1778, CSA 107.3, EN 62040-1-2, EN60950-1
Emission	FCC subpart J Level A, CSPR22, EN55022 Level A
Marks	$_{C}$CSA $_{US}$, CE (230VAC versions only)
Packaging	Designed to meet requirements for ISTA program.

NOTICE

The Novus FXM generates, uses and radiates radio frequencies if not installed and tested in accordance with the instructions in this manual. It has been tested and found to comply with the limits established for a Class A computing device pursuant to part 15 of FCC rules and CSPR 22 when it is operated alone. It also complies with the radio interference regulations of DOC which are designed to provide reasonable protection against such interference to radio to TV reception, which is determined by switching it on and off, relocate the equipment or use an electrical circuit other than the one used by the Novus FXM.

This page is intentionally left blank.

Index

Symbols

25-Event Log 43
48 VDC connector. *See* front panel: Encl Temp connector
100-event log. 54

A

AC input. *See* front panel: AC input terminal block
AC output. *See* front panel: AC output terminal block
alarm and fault displays. 87
Alarm Submenu. 87
    BAD BATTERY 87
    BATT TEMP HI 87
    FAN FAIL 87
    IN FREQ OUT OF RANGE. 87
    OVERLOAD 87
    SELF TEST 87
    USER INPUT ALARM 87
ATS (optional) 31

B

Batt Breaker Open. 87
batteries
    replacing 82
    replacing the 39
battery
    breaker 14
    connector 14
    corrosion inhibitor 28
    heating mats 24
    in-line-fuse 29
    temperature. 15
    voltage test points 15
    wiring harness. 28
battery temperature connector. *See* front panel: AC input terminal block
battery voltage, checking the. *See* front panel: AC input terminal block
branch circuit protection 21

C

Certifications and compliances
    CSA-C22.2 No. 107.1 7
    UL 1778. 7
circuit breaker
    battery. 14
    input 19
computer communication
    alarm display screen 49
    fault display screen 49
    input/output values screen 47
    line slow detection setup screen. 47
    main menu screen 46
    maintenance screen 47
    maintenance submenu 50
    menu tree 47
    output status 48
    unit specifications screen 47
contacts
    dry contacts 16
CONTROL MENU 40
    AUTO TEST 40
    BATT COMP 41
    CHARGE CUR 41
    DATE SEL. 41
    FREQUENCY 41
    FUNC MODE 41
    INV BYPASS. 40
    INVERTER 40
    INV RECORD 41
    QUAL TIME. 41
    SELF TEST 40
    SENSE TYPE 40
    SHUTDOWN. 40
    VOLTAGE 41

D

date and time setting 53
default settings, restoring 66
disconnect devices 21, 25
disconnects 25
dry contacts
    programming. 51, 68

E

EMC requirements 22
emergency shutdown. *See* inside back cover
enclosure temperature connector. *See* front panel: Encl Temp connector
external fan connector. *See* front panel: Encl Temp connector

Note: Listings in ALL UPPER CASE are entries as displayed on the LCD panel

F

Fan, internal. 14
FAULT submenu 88
front panel 14

G

generator 22
grounding 21, 25
GTS (optional) 31

I

installation 25
  mounting 26
  wiring. 30
  wiring the batteries 28

L

LAN (optional) 14
LCD Control Panel 15
LEDs
  alarm 18
  status 18
Line Status 48
Lithium battery. 53, 88

M

Main Menu. 46
making measurements 42
mounting. *See* installation: mounting

N

Network Equipment Building System (NEBS) 26
Novus User Software
  ALARMS & FAULTS screen 75
  COMMUNICATIONS screen 78
  EVENT HISTORY screen 76
  installation and setup 58
  Microsoft .NET Framework. 57
  operation. 59
  UPS MAINTENANCE screen 62
  UPS MONITORING screen 60

O

operating modes 35
options. 24

P

package content 23
password, setting the 50

R

RS-232 . . . . . 15, 45
RS-232 connector. *See* front panel: RS-232 connector

S

safety information 5
SELF TEST 17, 40
specifications. 89
  mechanical 89
split/multi-phase wiring 30
STATUS MENU 42
stranded wires. 30
symbols 10

T

terminal block
  input 19
  output 19
timer contact, setting. 52

U

User Input 17, 71
  triggers 73

W

wiring the external batteries. *See* installation: wiring the batteries
wiring the FXM. *See* installation: wiring

WARRANTY

AC PRODUCTS

Alpha Technologies Limited (ATL) warrants its products to be free from defects in material and workmanship for a period of two years from the date of purchase. ATL obligation under this warranty is limited to the repair or replacement, at its sole discretion, at the ATL factory or ATL Authorized Service Center, of any defective product. This warranty does not cover any failure of the unit caused in whole or in part by any cause or causes external to the unit. Repair or replacement does not extend the original warranty period. Parts furnished under this warranty may be new or factory-remanufactured.

Registration

This warranty is only available to the original end user of the product. Registering the product will automatically increase the length of the original warranty by 3 months at no additional cost. Please register your product online at *www.alpha.com/productregistration*.

Extended Warranty

Registered purchasers may extend the warranty period for up to 3 additional years at any time during the original warranty period at the then prevailing rate of ATL for such warranty extension. Registered purchasers may be eligible to purchase other units, accessories, parts or services at discounted rates, including battery upgrade or replacement, during the coverage period. Please contact us at 1-800-667-8743 to discuss your service needs.

Limitation of Liability

This warranty is the purchaser's sole remedy and is expressly in lieu of any other warranty, expressed or implied, including any implied warranty of merchantability or fitness for purpose.

In no event shall ATL be liable for any indirect, incidental, special or consequential damages. In no case will the liability of ATL under this warranty exceed the value of the unit provided.

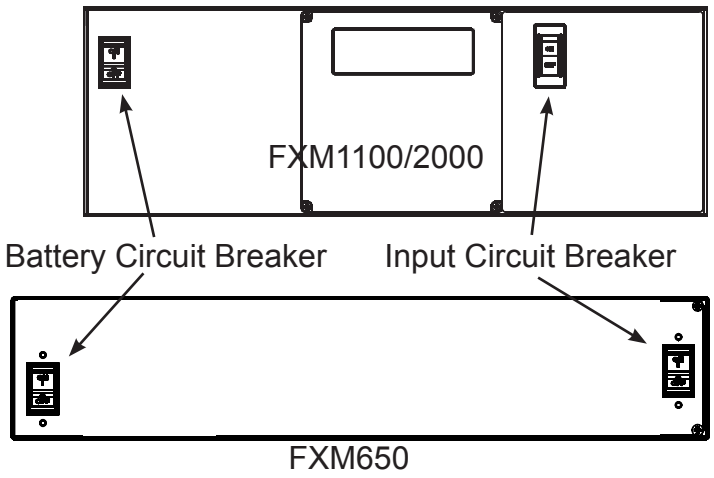
01/08

This page is intentionally left blank.

Emergency Shutdown Procedure

The Novus FXM UPS contains more than one live circuit. In an emergency, line power may be disconnected at the UPS's input, but there can still be AC power present at the output.

1. **Turn OFF the Input Circuit Breaker.**
2. **Turn OFF the Battery Circuit Breaker.**
3. **Disconnect the AC Input power.**
4. **Disconnect the battery string.**



For emergency technical support 7 days a week/24 hours a day, call:

Canada/USA: 1 800 667 8743

Complete the following for your records:

Serial # _____

Options_____

Purchase Date _____

This unit was purchased from:

Dealer_____

City_____

State/Province_____

Zip/Postal Code_____

Country _____

Telephone # _____

Fax # _____

E Mail Address _____

Alpha Technologies

Power

Alpha Technologies
3767 Alpha Way
Bellingham, WA 98226
USA
Tel: +1 360 647 2360
Fax: +1 360 671 4936
Web: www.alpha.com

Alpha Technologies Ltd.
4084 McConnell Court
Burnaby, BC, V5A 3N7
CANADA
Tel: +1 604 430 1476
Fax: +1 604 430 8908

Alpha Technologies
Europe Ltd.
Twyford House
Thorley
Bishop's Stortford
Hertfordshire
CM22 7PA
UNITED KINGDOM
Tel: +44 0 1279 501110
Fax: +44 0 1279 659870

Alpha Technologies GmbH
Hansastrasse 8
D 91126 Schwabach
GERMANY
Tel: +49 9122 79889 0
Fax: +49 9122 79889 21

Alphatec, Ltd
P.O. Box 56468
Limassol, Cyprus
CYPRUS
Tel: +357 25 375675
Fax: +357 25 359595

AlphaTEK ooo
Khokhlovskiy Pereulok 16
Stroenie 1, office 403
109028 Moscow
RUSSIA
Tel: +7 495 916 1854
Fax: +7 495 916 1349

Alphatec Baltics
S. Konarskio G. 49
Vilnius 2009
LITHUANIA
Tel: +350 5 210 5291
Fax: +350 5 210 5292

Alpha Technologies
5 Avenue Victor Hugo
F 92140 Calmart France
FRANCE
Tel: +33 3 41 90 07 07
Fax: +33 1 41 90 93 12

Due to continuing product improvements, Alpha reserves the right to change specifications without notice.
Copyright © 2007-2008 Alpha Technologies, Inc. All rights reserved. Alpha is a registered trademark of Alpha Technologies. 017-201-B0 Rev 0408.